

THE LANCET

Respiratory Medicine

Supplementary appendix 2

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Supplementary appendix

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eTable 1. Database coverage in terms of Brazilian municipalities and population

	Brazil	North	Northeast	Central-West	Southeast	South
Municipality coverage						
Municipalities	5,570	450	1,794	467	1,668	1,191
Municipalities with COVID-19 case	5,506 (98.9%)	450 (100%)	1787 (99.6%)	462 (98.9%)	1,637 (98.1%)	1,170 (98.2%)
Municipalities with at least 1 hospitalised patient in SIVEP-Gripe	4407/5506 (80%)	369/450 (82%)	1378/1787 (77%)	368/462 (80%)	1347/1637 (82%)	945/1170 (81%)
Population coverage						
Total population	211,755,692	18,672,591	57,374,243	16,504,303	89,012,240	30,192,315
Total population from municipalities that reported 1 adult hospitalised case in SIVEP-Gripe	203,250,793 (96%)	17,934,414 (96%)	53,253,926 (93%)	15,933,545 (97%)	87,072,377 (98%)	29,056,531 (96%)

Brazilian population based on the 2020 projections.

eTable 2. Description of the data sources used in this study

Data	Source	Source address	Version	Date exported
COVID-19 hospitalized cases	Influenza Epidemiological Surveillance Information System, "SIVEP-Gripe"	<p><i>OpenDataSUS</i> repository: https://opendatasus.saude.gov.br/dataset/bd-srag-2020</p> <p>Direct link for data of 12/10/2020: https://s3-sa-east-1.amazonaws.com/ckan.saude.gov.br/SRAG/2020/INFLUD-12-10-2020.csv</p>	12/10/2020	14/10/2020
COVID-19 cases and deaths by municipalities	State health departments ("SES"); Extracted and validated by brasil.io	https://brasil.io/dataset/covid19/caso_full/	20/10/2020	20/10/2020
Brazilian population dataset	Brazilian Institute of Geography and Statistics, "IBGE"	<p>Official IBGE website: https://www.ibge.gov.br/home/</p> <p>Direct link for population projection: ftp://ftp.ibge.gov.br/Projecao_da_Populacao/Projecao_da_Populacao_2018/projecoes_2018_populacao_2010_2060_20200406.xls</p>	06/04/2020	13/08/2020
Hospital and ICU beds	National Registry of Health Establishments, "CNES"	<p>Official CNES website: http://cnes.datasus.gov.br/</p> <p>Direct link for data: ftp://ftp.datasus.gov.br/cnes/BASE_DE_DADOS_CNES_202002.ZIP</p>	11/03/2020	13/08/2020

COVID-19: Disease caused by the SARS-CoV-2 virus

eTable 3. Detailed description of variables used in the study

Original variable name	Variable	Original coding	Collected from	Coding for this study	Comments
CS_SEXO	Sex	3 levels	National ID	Recoded to 2 levels. The Ignored level was considered as missing	
NU_IDADE_N & TP_IDADE	Age	Integer	Derived from difference between birth date and first symptoms date	Recoded to 6 levels	
CS_RACA	Self-reported race or skin colour	6 levels	Self-reported	Recoded to 4 levels: combined Black and Brown; kept White, Asian and Indigenous. The Ignored level was considered as missing	Self-reported race or skin colour is an important surrogate for socioeconomic position, social inequality, social capital and structural racism in Brazil. We referred to as “self-reported race” ^a
CS_ESCOL_N	Level of Education	7 levels	Self-reported	Recoded to 4 levels. Collapsing the categories of intermediate levels of education in “Up to high school” (included middle and elementary school). The Ignored level was considered as missing	Recoded to avoid sparse data
SG_UF_INTE	Region	27 levels	State of hospital admission	Recoded to 5 levels according to the official 5 geopolitical regions of Brazil.	
UTI	ICU admission	3 levels	Clinical record	Recoded to 2 levels. The Ignored level was considered as missing	
SUPPORT_VEN	Respiratory support	4 levels	Clinical record	Recoded to 3 levels. The Ignored level was considered as missing	
FEBRE, TOSSE, GARGANTA, DISPNEIA, DESC_RESP,	Symptoms	3 levels	Clinical record/Self-reported	Recoded to 2 levels. The Ignored level was considered as missing	

SATURACAO, DIARREIA, VOMITO, OUTRO_SIN				
CARDIOPATI, HEMATOLOGI, HEPATICA, DIABETES, NEUROLOGIC, PNEUMOPATI, RENAL, OBESIDADE, IMUNODEPRE, ASMA, SIND_DOWN, PUERPERA, OUT_MORB	Comorbidities	3 levels	Clinical record/Self-reported	Recoded to 3 levels. Missing and ignored levels were considered as no comorbidity
DT_NOTIFIC, DT_SIN_PRI, DT_INTERNA, DT_ENTUTI, DT_SAIDUTI, DT_EVOLUCA	Dates	Not applicable	User entered / notification system	We checked dates and corrected those typos in YYYY and/or clear mistakes
EVOLUCAO (Outcome)	In-hospital mortality	4 levels	Clinical record/follow-up	Recoded to 2 levels (Death/Discharge). Deaths grouped as all-cause in-hospital mortality. Missing and ignored levels were considered as missing and not use in the main analysis.
Not applicable	ICU mortality	Not applicable	Derived	We derived ICU mortality for those patients who were admitted to the ICU and have available both ICU and hospital discharge dates. We considered ICU death when the patient died in the hospital and had the same date for ICU and hospital discharge.

Not applicable	Any comorbidity	Not applicable	Derived	Derived variable by considering any comorbidity (Cardiovascular disease, Diabetes, Kidney disease, Obesity, Neurological disease, Chronic obstructive pulmonary disease, Immunodepression, Haematological disease, and Hepatic disease)	Selected by the literature of comorbidities associated with poor outcomes in COVID-19
Not applicable	Number of comorbidities	Not applicable	Derived	We added the nine comorbidities above for those patients without missing data in any of them in complete-case analysis	
Not applicable	SARI (severe acute respiratory infection)	Not applicable	Derived	Combination of symptoms: High fever (> 37.8°C) AND [Cough OR Sore Throat] AND [Respiratory distress OR Dyspnoea OR Oxygen saturation < 95%]	Original SARI definition also considers deaths outside hospitals. We derived SARI for those hospitalized.
Not applicable	SARI (severe acute respiratory infection) without fever criterion	Not applicable	Derived	Combination of symptoms: [Cough OR Sore Throat] AND [Respiratory distress OR Dyspnoea OR Oxygen saturation < 95%]	Adapted SARI definition for COVID-19 over the pandemic. We derived SARI for those hospitalized.
Not applicable	Time from onset of symptoms to Hospital admission, to ICU admission, and to death	Not applicable	Derived	We derived times from the date of the first symptoms to the date of hospital admission, ICU admission, and to death, when the dates are available. Times are in days. We censored the times in 30 days (percentile 95) and considered 0 days as missing.	
Not applicable	Length-of-stay in the Hospital and in the ICU	Not applicable	Derived	Length-of-stay were calculated in days using the reported dates of admission and discharge of hospital or the ICU.	
PCR_SARS2, PCR_RESUL, DS_PCR_OUT	RT-qPCR status for SARS-CoV-2	Not applicable	Derived	We corrected few patients that had positive RT-qPCR for SARS-CoV-2 but it was described as string in DS_PCR_OUT	Ministry of Health recommendation

^a Addressing racial inequalities in a pandemic: data limitations and a call for critical analyses. Pilecco FB, Leite L, Góes EF, Diele-Viegas LM, Aquino EML. Lancet Glob Health. 2020 Sep 15:S2214-109X(20)30360-0. / The correlation between ancestry and color in two cities of Northeast Brazil with contrasting ethnic compositions. Magalhaes da Silva T, Sandhya Rani MR, de Oliveira Costa GN, et al. Eur J Hum Genet 2015; 23(7): 984-9.

Supplementary methods: Multiple imputation

To conduct the multiple imputation, we used the database with a defined hospital outcome (n=232,036). We first investigated the patterns of missing variables. We explored whether missing values were conditioned on observed variables and the pattern suggested a missing at random (MAR) mechanism (Sterne JA, White IR, Carlin JB, et al. Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ* 2009; **338**: b2393) (**eTables 4, 5, 6 and 7 and eFigure 1**). We conducted multiple imputation by chained equations using the command *mi impute* in Stata 13.1 We followed the recommended steps to build the imputed model, including all variables of the interest, auxiliary variables (temporality: week of symptoms onset, regional: region/hospitalization in capitals, age) and the outcome. Below we show the imputation model specification and specifies the method used for each imputed variable. We generated 30 imputed datasets, following recent recommendations (Madley-Dowd P, et al. *J Clin Epidemiol*. 2019, 110:63-73) on and combined the results using Rubin's rule (Rubin DB. Multiple imputation for nonresponse in surveys. New York;: Wiley; 1987.). The distribution of the imputed variables before-and-after the imputation in on eTable 8. We also checked the convergence of values following the iterative process (10 iterations).

Variable	
Imputed variables	Sex, self-reported race, ICU admission, Respiratory support, Comorbidities (Cardiovascular disease, Diabetes, Kidney disease, Obesity, Neurological disease, Chronic obstructive pulmonary disease, Immunodepression, Haematological disease, and Hepatic disease), SARI, Oxygen saturation <95%, Dyspnoea, Respiratory distress and time from symptoms onset to hospital admission
Auxiliary variables	Region (factor), Age category (factor), Week of symptoms onset (factor), hospitalization in capitals (factor) and in-hospital mortality (factor)

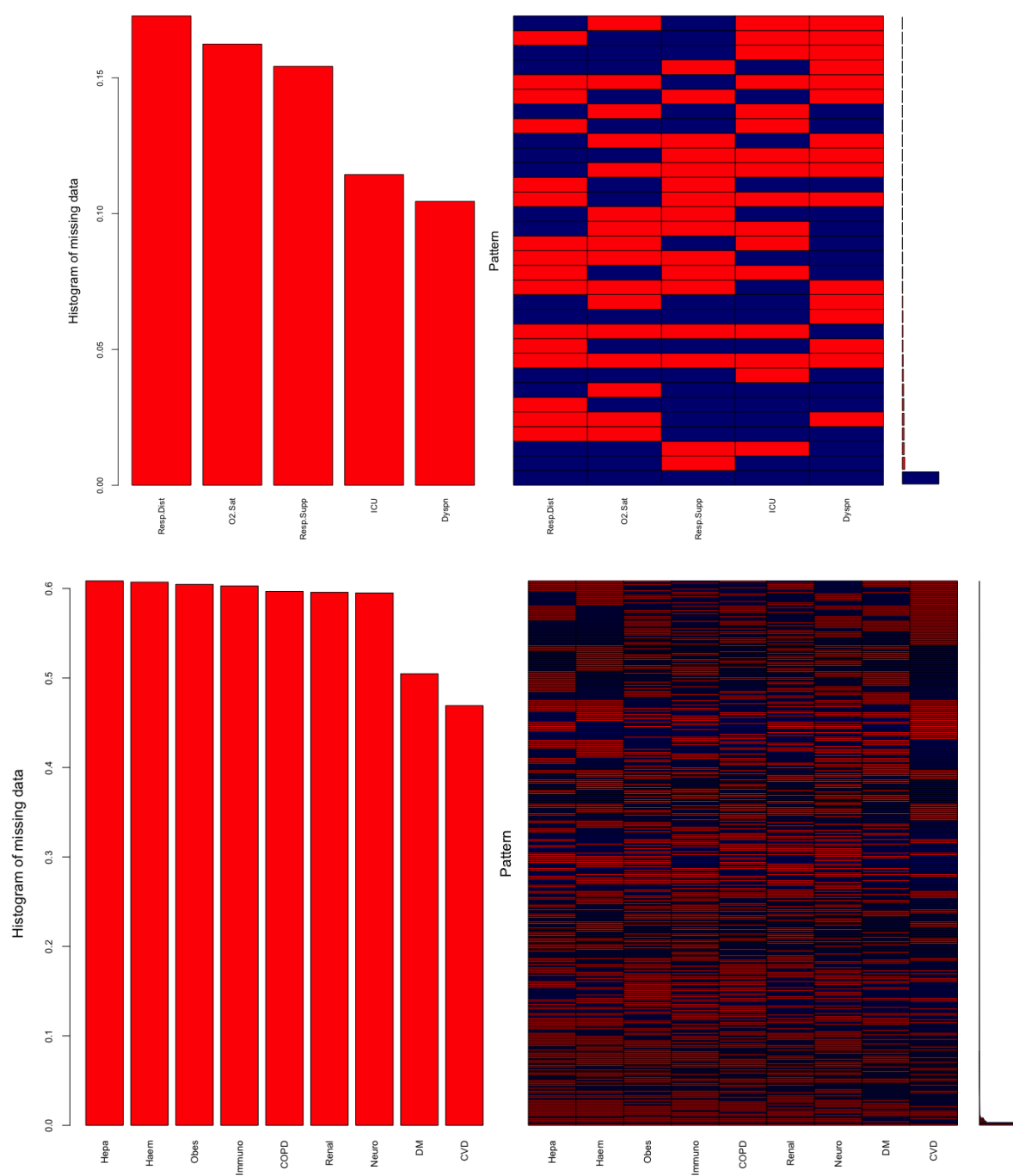
Methods used to impute the five covariates

Variable	Method used for imputation	Command
Sex, ICU admission, Comorbidities, SARI, Oxygen saturation, Dyspnoea, Respiratory distress	Binary logistic regression	"logit"
Self-reported race, Respiratory support, Time from symptoms onset to hospital admission	Multinomial logistic regression	"mlogit"

eTable 4. Missingness pattern (proportion of missing values in assessed variables) on the population used in the main analysis (RT-qPCR confirmed) (n=232,036 with a defined hospital outcome)

Variables, No. (%)	Brazil (n=232,036)	North (n=13,496)	Northeast (n=45,238)	Central-West (n=17,012)	Southeast (n=131,556)	South (n=24,734)
Covariates						
Sex	41 (<0.1%)	2 (<0.1%)	21 (<0.1%)	1 (<0.1%)	16 (<0.1%)	1 (<0.1%)
Comorbidities^a						
Complete case	84400 (36%)	4212 (31%)	14214 (31%)	7794 (46%)	46609 (35%)	11571 (47%)
1 missing value	4986 (2.1%)	283 (2.1%)	1134 (2.5%)	447 (2.6%)	2546 (1.9%)	576 (2.3%)
2 missing values	1025 (0.4%)	62 (0.5%)	228 (0.5%)	96 (0.6%)	517 (0.4%)	122 (0.5%)
3 missing values	328 (0.1%)	17 (0.1%)	69 (0.2%)	27 (0.2%)	185 (0.1%)	30 (0.1%)
4 missing values	210 (<0.1%)	12 (<0.1%)	43 (<0.1%)	14 (<0.1%)	122 (<0.1%)	19 (<0.1%)
5 missing values	703 (0.3%)	33 (0.2%)	122 (0.3%)	31 (0.2%)	435 (0.3%)	82 (0.3%)
6 missing values	3908 (1.7%)	140 (1.0%)	683 (1.5%)	147 (0.9%)	2554 (1.9%)	384 (1.6%)
7 missing values	15981 (6.9%)	751 (5.6%)	3212 (7.1%)	628 (3.7%)	10208 (7.8%)	1182 (4.8%)
8 missing values	29161 (13%)	1772 (13%)	6067 (13%)	1254 (7.4%)	18015 (14%)	2053 (8.3%)
All missing	91334 (39%)	6214 (46%)	19466 (43%)	6574 (39%)	50365 (38%)	8715 (35%)
Respiratory Support						
No	54314 (23%)	3047 (23%)	8177 (18%)	4076 (24%)	32756 (25%)	6258 (25%)
Yes, non-invasive	96729 (42%)	4743 (35%)	14485 (32%)	7561 (44%)	58444 (44%)	11496 (46%)
Yes, invasive	45205 (19%)	3155 (23%)	10322 (23%)	3667 (22%)	22648 (17%)	5413 (22%)
Missing	35788 (15%)	2551 (19%)	12254 (27%)	1708 (10%)	17708 (13%)	1567 (6.3%)
ICU admission						
No	125806 (54%)	8187 (61%)	19665 (43%)	9353 (55%)	73859 (56%)	14742 (60%)
Yes	79687 (34%)	3786 (28%)	14867 (33%)	6682 (39%)	45224 (34%)	9128 (37%)
Missing	26543 (11%)	1523 (11%)	10706 (24%)	977 (5.7%)	12473 (9.5%)	864 (3.5%)
Hospital outcomes						
Death	87515 (34%)	6727 (46%)	21858 (42%)	5964 (32%)	45269 (32%)	7697 (30%)
Discharge	144521 (57%)	6769 (46%)	23380 (45%)	11048 (59%)	86287 (60%)	17037 (66%)
Ongoing	22252 (8.8%)	1216 (8.3%)	6755 (13%)	1689 (9.0%)	11407 (8.0%)	1185 (4.6%)

^a Comorbidities considered: Cardiovascular disease, Diabetes, Kidney disease, Obesity, Neurological disease, Chronic obstructive pulmonary disease, Immunodepression, Haematological disease, and Hepatic disease

eFigure 1. Missingness pattern for ICU, respiratory support, signs/symptoms and comorbidities

eTable 5. Missing vs. not missing comorbidities (n=232,036, sample with defined hospital outcome)

	Missing comorbidities	Not Missing comorbidities
Age, median (IQR)	59 (45, 72)	65 (53, 76)
Age group, No. (%)		
20-39	23823 (16%)	6780 (8.0%)
40-49	24421 (17%)	9547 (11%)
50-59	27938 (19%)	15438 (18%)
60-69	28384 (19%)	19886 (24%)
70-79	23477 (16%)	17957 (21%)
80+	19593 (13%)	14792 (18%)
Sex, No. (%)		
Female	62344 (42%)	38482 (46%)
Male	85266 (58%)	45903 (54%)
Missing	26 (<0.1%)	15 (<0.1%)
Self-reported race, No. (%) *		
Black/Brown	48647 (33%)	31745 (38%)
White	48315 (33%)	35108 (42%)
Asian	1601 (1.1%)	989 (1.2%)
Indigenous	325 (0.2%)	152 (0.2%)
Missing	48748 (33%)	16406 (19%)
Respiratory support, No. (%)		
No	35396 (24%)	18918 (22%)
Yes, non-invasive	57659 (39%)	39070 (46%)
Yes, invasive	25275 (17%)	19930 (24%)
Missing	29306 (20%)	6482 (7.7%)
ICU admission, No. (%)		
No	78697 (53%)	47109 (56%)
Yes	46456 (31%)	33231 (39%)
Missing	22483 (15%)	4060 (4.8%)
Region, No. (%)		
North	9284 (6.3%)	4212 (5.0%)
Northeast	31024 (21%)	14214 (17%)
Central-West	9218 (6.2%)	7794 (9.2%)
Southeast	84947 (58%)	46609 (55%)
South	13163 (8.9%)	11571 (14%)
Hospitalization in capital city, No. (%)	85511 (58%)	40208 (48%)
Outcome, No. (%)		
Death	51403 (35%)	36112 (43%)
Discharge	96233 (65%)	48288 (57%)

* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

eTable 6. Missing ICU admission versus not missing ICU admission (n=232,036 with a defined hospital outcome)

	Missing ICU	Not missing ICU
Age, median (IQR)	63 (49, 74)	61 (48, 73)
Age group, No. (%)		
20-39	3294 (12%)	27309 (13%)
40-49	3615 (14%)	30353 (15%)
50-59	4656 (18%)	38720 (19%)
60-69	5653 (21%)	42617 (21%)
70-79	5011 (19%)	36423 (18%)
80+	4314 (16%)	30071 (15%)
Sex, No. (%)		
Female	11911 (45%)	88915 (43%)
Male	14616 (55%)	116553 (57%)
Missing	16 (<0.1%)	25 (<0.1%)
Number of comorbidities, No. (%)		
No comorbidities	794 (3.0%)	14183 (6.9%)
1-2	10002 (38%)	102934 (50%)
>=3	721 (2.7%)	12068 (5.9%)
Missing	15026 (57%)	76308 (37%)
Self-reported race, No. (%) *		
Black/Brown	9261 (35%)	71131 (35%)
White	6008 (23%)	77415 (38%)
Asian	318 (1.2%)	2272 (1.1%)
Indigenous	58 (0.2%)	419 (0.2%)
Missing	10898 (41%)	54256 (26%)
Respiratory support, No. (%)		
No	1395 (5.3%)	52919 (26%)
Yes, non-invasive	4913 (19%)	91816 (45%)
Yes, invasive	1150 (4.3%)	44055 (21%)
Missing	19085 (72%)	16703 (8.1%)
Region, No. (%)		
North	1523 (5.7%)	11973 (5.8%)
Northeast	10706 (40%)	34532 (17%)
Central-West	977 (3.7%)	16035 (7.8%)
Southeast	12473 (47%)	119083 (58%)
South	864 (3.3%)	23870 (12%)
Hospitalization in capital city, No. (%)	16650 (63%)	109069 (53%)
Outcome, No. (%)		
Death	11152 (42%)	76363 (37%)
Discharge	15391 (58%)	129130 (63%)

* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

eTable 7. Missing Respiratory support versus not missing Respiratory support (sample n=232,036 with a defined hospital outcome)

	Missing respiratory support	Not missing respiratory support
Age, median (IQR)	62 (48, 74)	61 (48, 73)
Age group, No. (%)		
20-39	4732 (13%)	25871 (13%)
40-49	5202 (15%)	28766 (15%)
50-59	6372 (18%)	37004 (19%)
60-69	7459 (21%)	40811 (21%)
70-79	6521 (18%)	34913 (18%)
80+	5502 (15%)	28883 (15%)
Sex, No. (%)		
Female	15798 (44%)	85028 (43%)
Male	19972 (56%)	111197 (57%)
Missing	18 (<0.1%)	23 (<0.1%)
Number of comorbidities, No. (%)		
No comorbidities	1417 (4.0%)	13560 (6.9%)
1-2	13447 (38%)	99489 (51%)
>=3	1015 (2.8%)	11774 (6.0%)
Missing	19909 (56%)	71425 (36%)
Self-reported race, No. (%) *		
Black/Brown	12278 (34%)	68114 (35%)
White	8562 (24%)	74861 (38%)
Asian	460 (1.3%)	2130 (1.1%)
Indigenous	87 (0.2%)	390 (0.2%)
Missing	14401 (40%)	50753 (26%)
ICU admission, No. (%)		
No	11000 (31%)	114806 (59%)
Yes	5703 (16%)	73984 (38%)
Missing	19085 (53%)	7458 (3.8%)
Region, No. (%)		
North	2551 (7.1%)	10945 (5.6%)
Northeast	12254 (34%)	32984 (17%)
Central-West	1708 (4.8%)	15304 (7.8%)
Southeast	17708 (49%)	113848 (58%)
South	1567 (4.4%)	23167 (12%)
Hospitalization in capital city, No. (%)	20950 (59%)	104769 (53%)
Outcome, No. (%)		
Death	14527 (41%)	72988 (37%)
Discharge	21261 (59%)	123260 (63%)

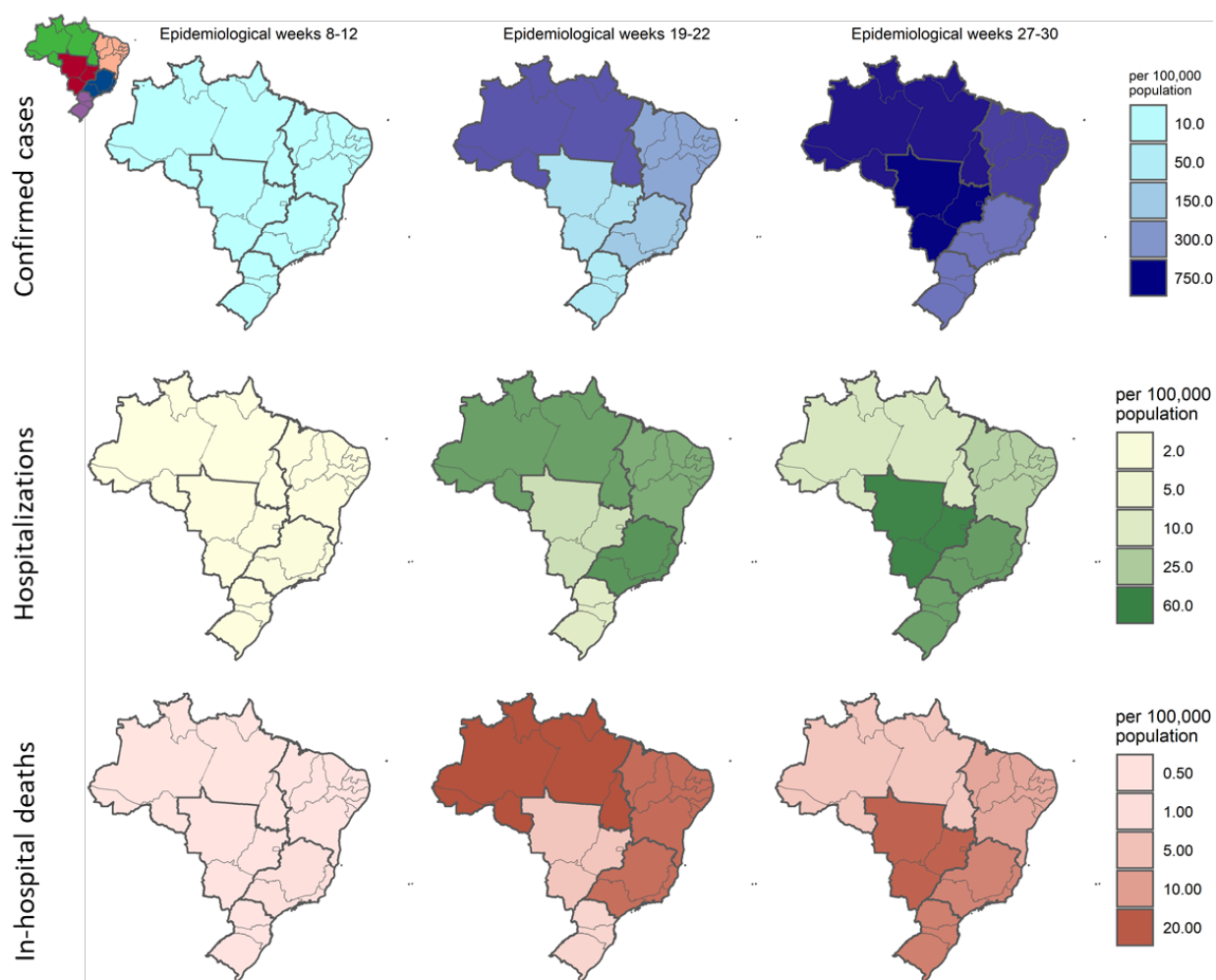
* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

eTable 8. Comparison between complete-case and imputed values (sample n=232,036 with a defined hospital outcome)

Imputed variables	Original (complete cases)	Imputed values
Sex		
Female	100,826/231,995 (43%)	43.5%
Male	131,169/231,995 (57%)	56.5%
Self-reported race *		
White	83,423/166,882 (50%)	48.1%
Black/Brown	80,392/166,882 (48%)	50.0%
Asian	2,590/166,882 (1.6%)	1.6%
Indigenous	477/166,882 (0.3%)	0.3%
Sign/Symptoms		
Oxygen Saturation < 95%	135,620/194,351 (70%)	70.8%
Dyspnoea	165,977/207,780 (80%)	80.4%
Respiratory distress	132,188/191,943 (69%)	70.5%
SARI	117,832/193,494 (61%)	62.3%
Comorbidities		
Cardiovascular disease	81,156/123,187 (66%)	64.2%
Diabetes	61,537/114,921 (54%)	54.1%
Obesity	11,617/91,744 (13%)	18.0%
Kidney disease	10,676/93,806 (11%)	16.7%
COPD	9,290/93,565 (10%)	14.0%
Neurological disease	9,654/93,969 (10%)	13.4%
Immunodepression	6,849/92,142 (7%)	11.7%
Hepatic disease	2,240/90,845 (3%)	7.1%
Haematological disease	1,963/91,161 (2%)	6.9%
Number of comorbidities		
0	13,836/84,400 (16%)	13.3%
1-2	62,766/84,400 (74%)	60.6%
≥3	7,798/84,400 (9%)	26.1%
Time from onset of symptoms to hospital admission		
≤ 3 days	74,728/228,447 (33%)	32.7%
≤ 6 days	56,914/228,447 (25%)	24.9%
≤ 9 days	51,416/228,447 (23%)	22.5%
≤ 12 days	25,007/228,447 (11%)	10.9%
≤ 15 days	11,684/228,447 (5%)	5.1%
> 15 days	8,698/228,447 (4%)	3.8%
Respiratory Support		
None	54,314/196,248 (28%)	27.7%
Yes, non-invasive	96,729/196,248 (49%)	49.1%
Yes, invasive	45,205/196,248 (23%)	23.2%
ICU admission	79,687/205,493 (39%)	38.9%

* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

eFigure 2. Epidemic evolution showed during three-time frames in Brazil with rates per 100,000 population



eTable 9. Number of COVID-19 cases, hospitalisations, and in-hospital deaths, absolute and age and sex-adjusted rates per 100,000 population for each time frame of the pandemic and region of Brazil

Region	Epidemiological Weeks			
	8 to 12	19 to 22	27 to 30	Overall
Brazil				
Population (Total)				211,755,692
Confirmed Cases	1,060	402,336	1,066,763	3,278,839
Rate per 100,000 population	0.5	190.0	503.8	1,548.4
Population (Adults)				151,778,729
Hospitalisation	1,243	58,292	57,615	254,288
Rate per 100,000 population	0.8	38.4	38.0	167.5
In-hospital Deaths	440	21,615	18,501	87,515
Rate per 100,000 population	0.3	14.2	12.2	57.7

Region	Hospitalisations	Crude rate per 100,000 population	Age-and-sex adj. rate per 100,000 population*	In-hospital Deaths	Crude rate per 100,000 population	Age-and-sex adj. rate per 100,000 population*
North	14,712	122.1	153.5	6,727	55.8	76.3
Northeast	51,993	130.4	137.1	21,858	54.8	58.3
Central-West	18,701	160.1	172.9	5,964	51.1	58.5
Southeast	142,963	217.3	207.8	45,269	68.8	64.1
South	25,919	115.9	109.3	7,697	34.4	31.3

* Brazilian 2020 projected population as reference.

eTable 10. Symptoms of hospitalised COVID-19 patients in Brazil and regions (sample n=254,288)

Symptoms	Brazil	North	Northeast	Central-West	Southeast	South
Cough, No. (%) [n = 229323 (90%)]	188423 / 229323 (82%)	11947 / 13615 (88%)	37703 / 44796 (84%)	13747 / 17705 (78%)	105914 / 128913 (82%)	19112 / 24294 (79%)
Fever, No. (%) [n = 226013 (89%)]	171396 / 226013 (76%)	11975 / 13668 (88%)	35539 / 43823 (81%)	12602 / 17507 (72%)	94565 / 127028 (74%)	16715 / 23987 (70%)
Dyspnoea, No. (%) [n = 226724 (89%)]	180818 / 226724 (80%)	11379 / 13532 (84%)	36883 / 44413 (83%)	13709 / 17694 (77%)	99548 / 126589 (79%)	19299 / 24496 (79%)
Oxygen saturation < 95%, No. (%) [n = 212016 (83%)]	147596 / 212016 (70%)	7955 / 11901 (67%)	27410 / 39688 (69%)	10913 / 17097 (64%)	85739 / 120027 (71%)	15579 / 23303 (67%)
Respiratory distress, No. (%) [n = 209145 (82%)]	143977 / 209145 (69%)	9802 / 12538 (78%)	26737 / 38207 (70%)	11286 / 17083 (66%)	80530 / 118114 (68%)	15622 / 23203 (67%)
Sore throat, No. (%) [n = 185936 (73%)]	46239 / 185936 (25%)	5193 / 11638 (45%)	8130 / 31754 (26%)	3052 / 16059 (19%)	24619 / 104815 (23%)	5245 / 21670 (24%)
Diarrhoea, No. (%) [n = 182938 (72%)]	34515 / 182938 (19%)	2338 / 11157 (21%)	5855 / 31356 (19%)	2556 / 16170 (16%)	19485 / 102533 (19%)	4281 / 21722 (20%)
Vomit, No. (%) [n = 178603 (70%)]	19802 / 178603 (11%)	1199 / 10859 (11%)	3321 / 30394 (11%)	1518 / 15954 (9.5%)	11240 / 100040 (11%)	2524 / 21356 (12%)
Other symptoms, No. (%) [n = 182647 (72%)]	87316 / 182647 (48%)	4305 / 10661 (40%)	17327 / 33223 (52%)	7796 / 15758 (49%)	47292 / 101788 (46%)	10596 / 21217 (50%)

eTable 11. Chronic comorbidities description of hospitalised COVID-19 patients in Brazil (sample n=254,288)

Comorbidities	Brazil	North	Northeast	Central-West	Southeast	South
Cardiovascular disease, No. (%)						
No	45248 / 254288 (18%)	2563 / 14712 (17%)	8645 / 51993 (17%)	4549 / 18701 (24%)	23465 / 142963 (16%)	6026 / 25919 (23%)
Yes	88279 / 254288 (35%)	4049 / 14712 (28%)	16310 / 51993 (31%)	5811 / 18701 (31%)	53015 / 142963 (37%)	9094 / 25919 (35%)
Missing	120761 / 254288 (47%)	8100 / 14712 (55%)	27038 / 51993 (52%)	8341 / 18701 (45%)	66483 / 142963 (47%)	10799 / 25919 (42%)
Diabetes, No. (%)						
No	57461 / 254288 (23%)	2748 / 14712 (19%)	9901 / 51993 (19%)	5382 / 18701 (29%)	31378 / 142963 (22%)	8052 / 25919 (31%)
Yes	66871 / 254288 (26%)	3605 / 14712 (25%)	14145 / 51993 (27%)	4896 / 18701 (26%)	37742 / 142963 (26%)	6483 / 25919 (25%)
Missing	129956 / 254288 (51%)	8359 / 14712 (57%)	27947 / 51993 (54%)	8423 / 18701 (45%)	73843 / 142963 (52%)	11384 / 25919 (44%)
Kidney disease, No. (%)						
No	89542 / 254288 (35%)	4449 / 14712 (30%)	16024 / 51993 (31%)	8464 / 18701 (45%)	48837 / 142963 (34%)	11768 / 25919 (45%)
Yes	11467 / 254288 (4.5%)	634 / 14712 (4.3%)	2378 / 51993 (4.6%)	784 / 18701 (4.2%)	6383 / 142963 (4.5%)	1288 / 25919 (5.0%)
Missing	153279 / 254288 (60%)	9629 / 14712 (65%)	33591 / 51993 (65%)	9453 / 18701 (51%)	87743 / 142963 (61%)	12863 / 25919 (50%)
Obesity, No. (%)						
No	86270 / 254288 (34%)	4525 / 14712 (31%)	15850 / 51993 (30%)	8093 / 18701 (43%)	46730 / 142963 (33%)	11072 / 25919 (43%)
Yes	12556 / 254288 (4.9%)	355 / 14712 (2.4%)	1714 / 51993 (3.3%)	991 / 18701 (5.3%)	7520 / 142963 (5.3%)	1976 / 25919 (7.6%)
Missing	155462 / 254288 (61%)	9832 / 14712 (67%)	34429 / 51993 (66%)	9617 / 18701 (51%)	88713 / 142963 (62%)	12871 / 25919 (50%)
Neurological disease, No. (%)						
No	90869 / 254288 (36%)	4707 / 14712 (32%)	16642 / 51993 (32%)	8602 / 18701 (46%)	49275 / 142963 (34%)	11643 / 25919 (45%)
Yes	10299 / 254288 (4.1%)	292 / 14712 (2.0%)	1592 / 51993 (3.1%)	610 / 18701 (3.3%)	6308 / 142963 (4.4%)	1497 / 25919 (5.8%)
Missing	153120 / 254288 (60%)	9713 / 14712 (66%)	33759 / 51993 (65%)	9489 / 18701 (51%)	87380 / 142963 (61%)	12779 / 25919 (49%)
COPD, No. (%)						
No	90816 / 254288 (36%)	4631 / 14712 (31%)	16755 / 51993 (32%)	8487 / 18701 (45%)	49375 / 142963 (35%)	11568 / 25919 (45%)
Yes	9914 / 254288 (3.9%)	388 / 14712 (2.6%)	1370 / 51993 (2.6%)	792 / 18701 (4.2%)	5768 / 142963 (4.0%)	1596 / 25919 (6.2%)
Missing	153558 / 254288 (60%)	9693 / 14712 (66%)	33868 / 51993 (65%)	9422 / 18701 (50%)	87820 / 142963 (61%)	12755 / 25919 (49%)
Immunodepression, No. (%)						
No	91884 / 254288 (36%)	4584 / 14712 (31%)	16586 / 51993 (32%)	8715 / 18701 (47%)	50070 / 142963 (35%)	11929 / 25919 (46%)

Yes	7314 / 254288 (2.9%)	417 / 14712 (2.8%)	1315 / 51993 (2.5%)	429 / 18701 (2.3%)	4123 / 142963 (2.9%)	1030 / 25919 (4.0%)
Missing	155090 / 254288 (61%)	9711 / 14712 (66%)	34092 / 51993 (66%)	9557 / 18701 (51%)	88770 / 142963 (62%)	12960 / 25919 (50%)
Asthma, No. (%)						
No	92690 / 254288 (36%)	4684 / 14712 (32%)	17041 / 51993 (33%)	8692 / 18701 (46%)	50273 / 142963 (35%)	12000 / 25919 (46%)
Yes	6858 / 254288 (2.7%)	300 / 14712 (2.0%)	988 / 51993 (1.9%)	516 / 18701 (2.8%)	4032 / 142963 (2.8%)	1022 / 25919 (3.9%)
Missing	154740 / 254288 (61%)	9728 / 14712 (66%)	33964 / 51993 (65%)	9493 / 18701 (51%)	88658 / 142963 (62%)	12897 / 25919 (50%)
Haematological disease, No. (%)						
No	96004 / 254288 (38%)	4831 / 14712 (33%)	17390 / 51993 (33%)	9013 / 18701 (48%)	52164 / 142963 (36%)	12606 / 25919 (49%)
Yes	2130 / 254288 (0.8%)	101 / 14712 (0.7%)	392 / 51993 (0.8%)	114 / 18701 (0.6%)	1290 / 142963 (0.9%)	233 / 25919 (0.9%)
Missing	156154 / 254288 (61%)	9780 / 14712 (66%)	34211 / 51993 (66%)	9574 / 18701 (51%)	89509 / 142963 (63%)	13080 / 25919 (50%)
Hepatic disease, No. (%)						
No	95414 / 254288 (38%)	4807 / 14712 (33%)	17256 / 51993 (33%)	8957 / 18701 (48%)	51906 / 142963 (36%)	12488 / 25919 (48%)
Yes	2395 / 254288 (0.9%)	106 / 14712 (0.7%)	475 / 51993 (0.9%)	150 / 18701 (0.8%)	1310 / 142963 (0.9%)	354 / 25919 (1.4%)
Missing	156479 / 254288 (62%)	9799 / 14712 (67%)	34262 / 51993 (66%)	9594 / 18701 (51%)	89747 / 142963 (63%)	13077 / 25919 (50%)
Puerperal ^a , No. (%)						
No	44184 / 110722 (40%)	1966 / 5894 (33%)	7913 / 22987 (34%)	4100 / 7971 (51%)	24461 / 62605 (39%)	5744 / 11265 (51%)
Yes	757 / 110722 (0.7%)	70 / 5894 (1.2%)	246 / 22987 (1.1%)	76 / 7971 (1.0%)	318 / 62605 (0.5%)	47 / 11265 (0.4%)
Missing	65781 / 110722 (59%)	3858 / 5894 (65%)	14828 / 22987 (65%)	3795 / 7971 (48%)	37826 / 62605 (60%)	5474 / 11265 (49%)
Down syndrome, No. (%)						
No	97308 / 254288 (38%)	4874 / 14712 (33%)	17790 / 51993 (34%)	9094 / 18701 (49%)	52747 / 142963 (37%)	12803 / 25919 (49%)
Yes	648 / 254288 (0.3%)	37 / 14712 (0.3%)	118 / 51993 (0.2%)	44 / 18701 (0.2%)	380 / 142963 (0.3%)	69 / 25919 (0.3%)
Missing	156332 / 254288 (61%)	9801 / 14712 (67%)	34085 / 51993 (66%)	9563 / 18701 (51%)	89836 / 142963 (63%)	13047 / 25919 (50%)
Other comorbidities, No. (%)						
No	50217 / 254288 (20%)	2682 / 14712 (18%)	8420 / 51993 (16%)	4376 / 18701 (23%)	28676 / 142963 (20%)	6063 / 25919 (23%)
Yes	69893 / 254288 (27%)	3161 / 14712 (21%)	15041 / 51993 (29%)	5861 / 18701 (31%)	37538 / 142963 (26%)	8292 / 25919 (32%)
Missing	134178 / 254288 (53%)	8869 / 14712 (60%)	28532 / 51993 (55%)	8464 / 18701 (45%)	76749 / 142963 (54%)	11564 / 25919 (45%)

^a Data from female patients

eTable 12. Times of the disease among patients with a defined hospital outcome (main analysis)

	Brazil (n=232,036)	North (n=13,496)	Northeast (n=45,238)	Central-West (n=17,012)	Southeast (n=131,556)	South (n=24,734)
Time from onset of symptoms, median (IQR)						
to hospital admission [n = 202842 (87%)]	6 (4, 9)	7 (4, 10)	6 (4, 9)	7 (4, 10)	6 (4, 9)	6 (3, 9)
to ICU admission [n = 72154 (91%)]	7 (4, 10)	8 (5, 12)	7 (4, 10)	7 (5, 10)	7 (4, 10)	7 (4, 10)
to death [n = 86482 (99%)]	15 (9, 23)	13 (8, 21)	14 (8, 22)	16 (10, 25)	15 (9, 23)	16 (10, 26)
Time from hospital admission to death [n = 80527 (92%)]	10 (5, 17)	7 (3, 14)	9 (4, 16)	11 (5, 19)	10 (5, 18)	12 (6, 20)

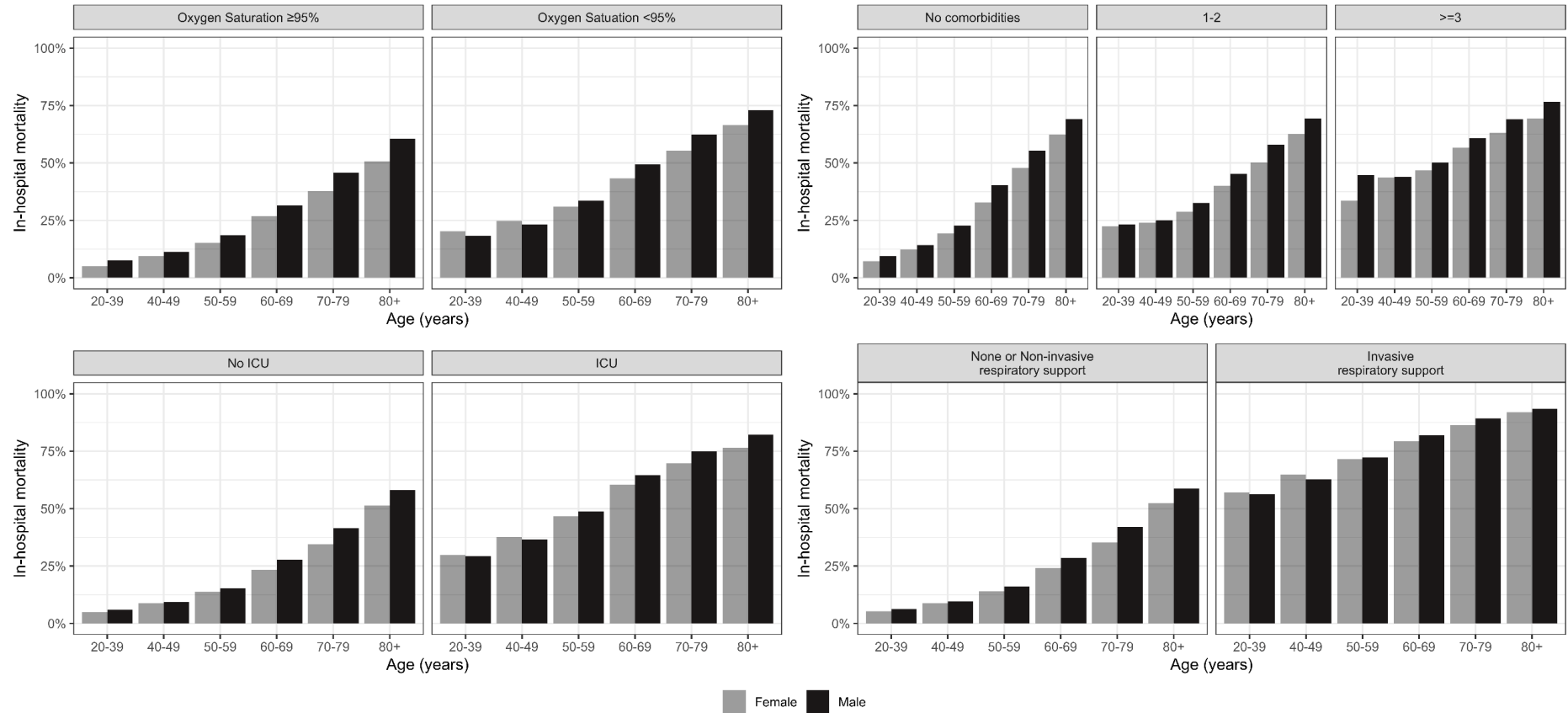
The numbers and proportions within brackets refer to the available data for each variable. ICU – intensive care unit

eTable 13. In-hospital mortality stratified by age and sex in Brazil

	Total	By age
Total	232036	87515/232036 (38%)
Age groups		
20-39	30603	3780/30603 (12%)
40-49	33968	6162/33968 (18%)
50-59	43376	11818/43376 (27%)
60-69	48270	20317/48270 (42%)
70-79	41434	22651/41434 (55%)
80+	34385	22787/34385 (66%)

	Total	Female	Male
Total	231995	36827/100826 (37%)	50676/131169 (39%)
Age groups			
20-39	30594	1577/13976 (11%)	2202/16618 (13%)
40-49	33960	2249/12781 (18%)	3913/21179 (18%)
50-59	43369	4374/17221 (25%)	7442/26148 (28%)
60-69	48258	7838/20211 (39%)	12473/28047 (44%)
70-79	41432	9337/18470 (51%)	13313/22962 (58%)
80+	34382	11452/18167 (63%)	11333/16215 (70%)

eFigure 3. In-hospital mortality stratified by age and sex accounting for the reported symptom of oxygen saturation < 95%, number of comorbidities, ICU admission, and respiratory support.



eTable 14. In-hospital mortality stratified by chronic comorbidities, level of education and self-reported race and age**Comorbidities**

	Total	No Comorbidity	1-2 Comorbidities	≥ 3 Comorbidities
Total	84400	4494/13836 (32%)	26933/62766 (43%)	4685/7798 (60%)
Age groups				
20-39	6780	291/2245 (13%)	937/4278 (22%)	104/257 (40%)
40-49	9547	396/2171 (18%)	1591/6824 (23%)	243/552 (44%)
50-59	15438	625/2691 (23%)	3432/11484 (30%)	594/1263 (47%)
60-69	19886	951/2691 (35%)	6300/15112 (42%)	1187/2083 (57%)
70-79	17957	1051/2165 (49%)	7360/13772 (53%)	1349/2020 (67%)
80+	14792	1180/1873 (63%)	7313/11296 (65%)	1208/1623 (74%)

Self-reported race *

	Total	White	Black/Brown	Asian	Indigenous
Total	166882	30061/83423 (36%)	34345/80392 (43%)	1031/2590 (40%)	202/477 (42%)
Age groups					
20-39	21677	1041/10493 (10%)	1775/10817 (16%)	43/300 (14%)	11/67 (16%)
40-49	23813	1758/11477 (15%)	2784/11955 (23%)	54/302 (18%)	19/79 (24%)
50-59	30866	3610/15171 (24%)	5053/15175 (33%)	122/428 (29%)	37/92 (40%)
60-69	34990	6703/17302 (39%)	8319/17043 (49%)	221/554 (40%)	31/91 (34%)
70-79	30519	8027/15378 (52%)	8773/14504 (60%)	289/561 (52%)	51/76 (67%)
80+	25017	8922/13602 (66%)	7641/10898 (70%)	302/445 (68%)	53/72 (74%)

* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

Level of education

	Total	Illiterate	Up to high school	High school	College/University
Total	79721	3146/4993 (63%)	16489/35750 (46%)	7735/26146 (30%)	2952/12832 (23%)
Age groups					
20-39	11890	46/132 (35%)	451/2238 (20%)	755/6291 (12%)	235/3229 (7%)
40-49	12354	67/174 (39%)	884/3674 (24%)	988/5715 (17%)	323/2791 (12%)
50-59	15279	168/385 (44%)	2081/6729 (31%)	1511/5592 (27%)	483/2573 (19%)
60-69	16216	513/885 (58%)	4107/8922 (46%)	1823/4265 (43%)	698/2144 (33%)
70-79	13405	939/1479 (63%)	4664/8075 (58%)	1474/2562 (58%)	646/1289 (50%)
80+	10577	1413/1938 (73%)	4302/6112 (70%)	1184/1721 (69%)	567/806 (70%)

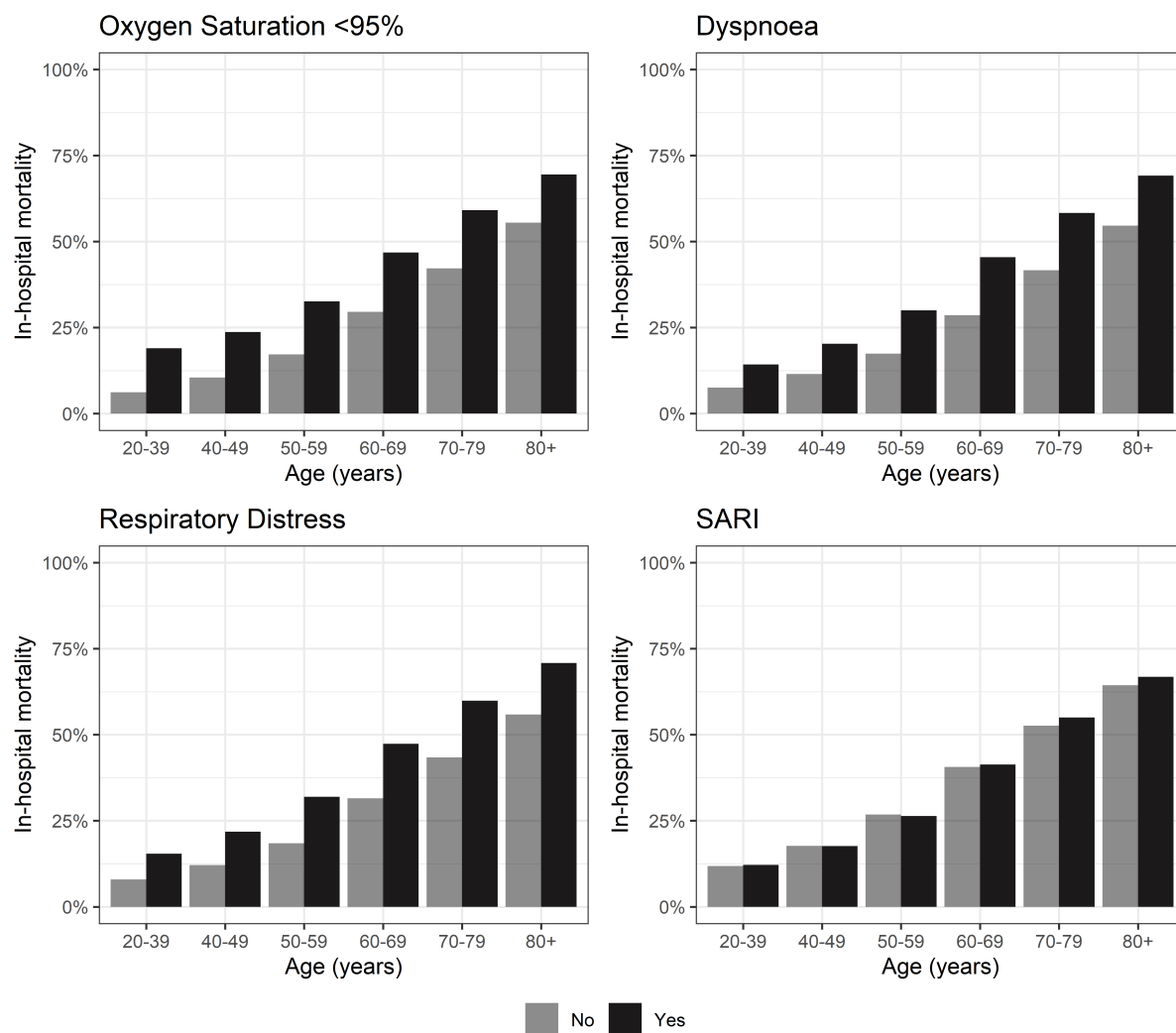
eTable 15. In-hospital mortality stratified by ICU admission, respiratory support and age

	Total	No ICU admission	ICU admission
Total	205493	29361/125806 (23%)	47002/79687 (59%)
Age groups			
20-39	27309	1088/19797 (5%)	2225/7512 (30%)
40-49	30353	1910/20875 (9%)	3503/9478 (37%)
50-59	38720	3634/24686 (15%)	6732/14034 (48%)
60-69	42617	6350/24559 (26%)	11372/18058 (63%)
70-79	36423	7499/19575 (38%)	12257/16848 (73%)
80+	30071	8880/16314 (54%)	10913/13757 (79%)

	Total	No respiratory support	Non-invasive ventilation	Invasive mechanical ventilation
Total	196248	8655/54314 (16%)	28287/96729 (29%)	36046/45205 (80%)
Age groups				
20-39	25871	396/11482 (3%)	929/11111 (8%)	1858/3278 (57%)
40-49	28766	597/10170 (6%)	1663/14108 (12%)	2850/4488 (64%)
50-59	37004	1085/10625 (10%)	3409/18793 (18%)	5459/7586 (72%)
60-69	40811	1862/9467 (20%)	6031/20196 (30%)	9028/11148 (81%)
70-79	34913	2225/7178 (31%)	7214/17029 (42%)	9433/10706 (88%)
80+	28883	2490/5392 (46%)	9041/15492 (58%)	7418/7999 (93%)

	Total	No respiratory support		Non-invasive ventilation		Invasive mechanical ventilation	
		No ICU	ICU	No ICU	ICU	No ICU	ICU
Total	188790	6009/44250 (14%)	2333/8669 (27%)	16041/64580 (25%)	10568/2723 (6 (39%))	4380/597 (6 (73%))	30753/38079 (81%)
Age groups							
20-39	25074	269/9796 (3%)	112/1420 (8%)	501/7792 (6%)	372/2850 (13%)	215/472 (46%)	1606/2744 (59%)
40-49	27766	426/8486 (5%)	140/1427 (10%)	913/9854 (9%)	664/3627 (18%)	331/658 (50%)	2450/3714 (66%)
50-59	35630	766/8735 (9%)	280/1626 (17%)	1859/12838 (14%)	1333/5036 (26%)	667/1013 (66%)	4659/6382 (73%)
60-69	39147	1284/7656 (17%)	499/1556 (32%)	3342/13337 (25%)	2323/5742 (40%)	1062/137 (8 (77%))	7721/9478 (81%)
70-79	33530	1532/5556 (28%)	615/1414 (43%)	4082/10956 (37%)	2710/5157 (53%)	1127/134 (4 (84%))	8086/9103 (89%)
80+	27643	1732/4021 (43%)	687/1226 (56%)	5344/9803 (55%)	3166/4824 (66%)	978/1111 (88%)	6231/6658 (94%)

eFigure 4. In-hospital mortality per age group for symptoms of Oxygen saturation < 95%, Dyspnoea, respiratory distress, and SARI diagnosis



eTable 16. Health system burden in Brazil and its regions (number / per 100,000 inhabitants)**Hospitalisations per population**

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	232036/151778729	152.9	13496/12049813	112.0	45238/39882347	113.4	17012/11678574	145.7	131556/65803414	199.9	24734/22364581	110.6
Age groups												
20-39	30603/68451093	44.7	1976/6448447	30.6	5587/19048242	29.3	2498/5484644	45.5	17170/28059711	61.2	3372/9410049	35.8
40-49	33968/29255478	116.1	1973/2357103	83.7	5575/7654000	72.8	2795/2386731	117.1	19901/12717264	156.5	3724/4140380	89.9
50-59	43376/23875081	181.7	2272/1600270	142.0	7461/5930317	125.8	3373/1825822	184.7	25389/10724660	236.7	4881/3794012	128.7
60-69	48270/16732972	288.5	2816/974828	288.9	9195/3893805	236.1	3436/1155857	297.3	27453/7919342	346.7	5370/2789140	192.5
70-79	41434/9023052	459.2	2616/470277	556.3	9086/2245607	404.6	2823/575162	490.8	22658/4225114	536.3	4251/1506892	282.1
80+	34385/4441053	774.3	1843/198888	926.7	8334/1110376	750.6	2087/250358	833.6	18985/2157323	880.0	3136/724108	433.1

ICU admissions per population

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	79687/151778729	52.5	3786/12049813	31.4	14867/39882347	37.3	6682/11678574	57.2	45224/65803414	68.7	9128/22364581	40.8
Age groups												
20-39	7512/68451093	11.0	334/6448447	5.2	1279/19048242	6.7	732/5484644	13.3	4354/28059711	15.5	813/9410049	8.6
40-49	9478/29255478	32.4	404/2357103	17.1	1440/7654000	18.8	890/2386731	37.3	5630/12717264	44.3	1114/4140380	26.9
50-59	14034/23875081	58.8	645/1600270	40.3	2324/5930317	39.2	1266/1825822	69.3	8097/10724660	75.5	1702/3794012	44.9
60-69	18058/16732972	107.9	950/974828	97.5	3318/3893805	85.2	1420/1155857	122.9	10094/7919342	127.5	2276/2789140	81.6
70-79	16848/9023052	186.7	891/470277	189.5	3401/2245607	151.5	1345/575162	233.8	9264/4225114	219.3	1947/1506892	129.2
80+	13757/4441053	309.8	562/198888	282.6	3105/1110376	279.6	1029/250358	411.0	7785/2157323	360.9	1276/724108	176.2

Hospitalisations requiring invasive mechanical ventilation per population

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	45205/151778729	29.8	3155/12049813	26.2	10322/39882347	25.9	3667/11678574	31.4	22648/65803414	34.4	5413/22364581	24.2
Age groups												
20-39	3278/68451093	4.8	250/6448447	3.9	791/19048242	4.2	279/5484644	5.1	1559/28059711	5.6	399/9410049	4.2
40-49	4488/29255478	15.3	334/2357103	14.2	947/7654000	12.4	397/2386731	16.6	2239/12717264	17.6	571/4140380	13.8
50-59	7586/23875081	31.8	520/1600270	32.5	1579/5930317	26.6	605/1825822	33.1	3923/10724660	36.6	959/3794012	25.3
60-69	11148/16732972	66.6	821/974828	84.2	2353/3893805	60.4	875/1155857	75.7	5673/7919342	71.6	1426/2789140	51.1
70-79	10706/9023052	118.7	765/470277	162.7	2494/2245607	111.1	863/575162	150.0	5291/4225114	125.2	1293/1506892	85.8
80+	7999/4441053	180.1	465/198888	233.8	2158/1110376	194.3	648/250358	258.8	3963/2157323	183.7	765/724108	105.6

eTable 17. Overall in-hospital mortality, among those admitted to the ICU or under invasive mechanical ventilation, stratified by age and Brazilian regions.

In-hospital mortality (Overall)

	Brazil	North	Northeast	Central-West	Southeast	South
Total	87515/232036 (37.7%)	6727/13496 (49.8%)	21858/45238 (48.3%)	5964/17012 (35.1%)	45269/131556 (34.4%)	7697/24734 (31.1%)
Age groups						
20-39	3780/30603 (12.4%)	393/1976 (19.9%)	1083/5587 (19.4%)	284/2498 (11.4%)	1736/17170 (10.1%)	284/3372 (8.4%)
40-49	6162/33968 (18.1%)	556/1973 (28.2%)	1542/5575 (27.7%)	504/2795 (18%)	3062/19901 (15.4%)	498/3724 (13.4%)
50-59	11818/43376 (27.2%)	945/2272 (41.6%)	2893/7461 (38.8%)	863/3373 (25.6%)	6119/25389 (24.1%)	998/4881 (20.4%)
60-69	20317/48270 (42.1%)	1662/2816 (59%)	4730/9195 (51.4%)	1380/3436 (40.2%)	10659/27453 (38.8%)	1886/5370 (35.1%)
70-79	22651/41434 (54.7%)	1784/2616 (68.2%)	5660/9086 (62.3%)	1528/2823 (54.1%)	11583/22658 (51.1%)	2096/4251 (49.3%)
80+	22787/34385 (66.3%)	1387/1843 (75.3%)	5950/8334 (71.4%)	1405/2087 (67.3%)	12110/18985 (63.8%)	1935/3136 (61.7%)

In-hospital mortality (ICU admissions)

	Brazil	North	Northeast	Central-West	Southeast	South
Total	47002/79687 (59%)	3022/3786 (79.8%)	10483/14867 (70.5%)	3734/6682 (55.9%)	24693/45224 (54.6%)	5070/9128 (55.5%)
Age groups						
20-39	2225/7512 (29.6%)	195/334 (58.4%)	579/1279 (45.3%)	185/732 (25.3%)	1065/4354 (24.5%)	201/813 (24.7%)
40-49	3503/9478 (37%)	265/404 (65.6%)	799/1440 (55.5%)	324/890 (36.4%)	1763/5630 (31.3%)	352/1114 (31.6%)
50-59	6732/14034 (48%)	468/645 (72.6%)	1441/2324 (62%)	554/1266 (43.8%)	3513/8097 (43.4%)	756/1702 (44.4%)
60-69	11372/18058 (63%)	800/950 (84.2%)	2350/3318 (70.8%)	896/1420 (63.1%)	5980/10094 (59.2%)	1346/2276 (59.1%)
70-79	12257/16848 (72.8%)	779/891 (87.4%)	2720/3401 (80%)	954/1345 (70.9%)	6408/9264 (69.2%)	1396/1947 (71.7%)
80+	10913/13757 (79.3%)	515/562 (91.6%)	2594/3105 (83.5%)	821/1029 (79.8%)	5964/7785 (76.6%)	1019/1276 (79.9%)

In-hospital mortality (Invasive mechanical ventilation)

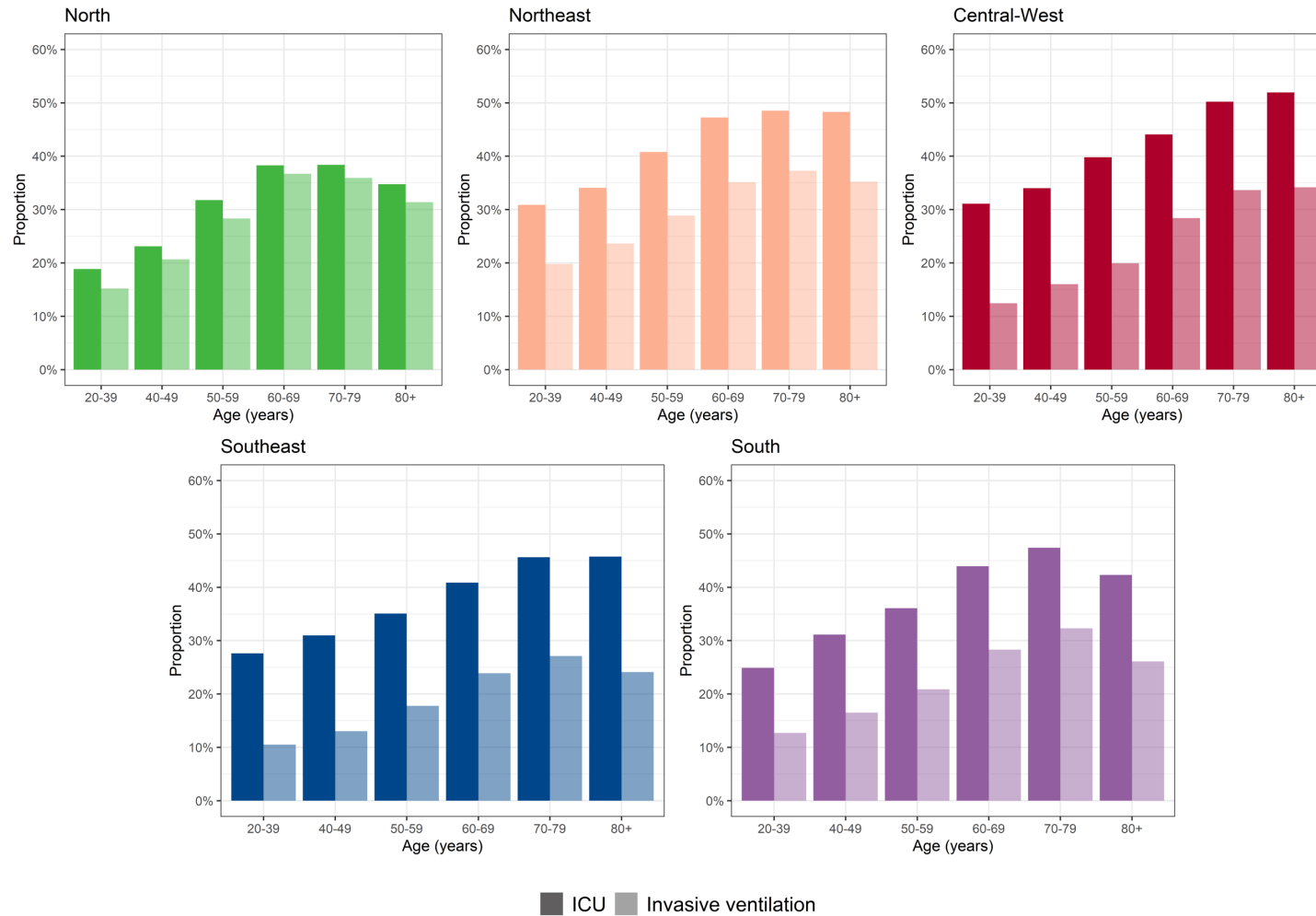
	Brazil	North	Northeast	Central-West	Southeast	South
Total	36046/45205 (79.7%)	2810/3155 (89.1%)	8963/10322 (86.8%)	3039/3667 (82.9%)	17325/22648 (76.5%)	3909/5413 (72.2%)
Age groups						
20-39	1858/3278 (56.7%)	193/250 (77.2%)	551/791 (69.7%)	164/279 (58.8%)	774/1559 (49.6%)	176/399 (44.1%)
40-49	2850/4488 (63.5%)	269/334 (80.5%)	717/947 (75.7%)	273/397 (68.8%)	1317/2239 (58.8%)	274/571 (48%)
50-59	5459/7586 (72%)	446/520 (85.8%)	1291/1579 (81.8%)	456/605 (75.4%)	2662/3923 (67.9%)	604/959 (63%)
60-69	9028/11148 (81%)	748/821 (91.1%)	2056/2353 (87.4%)	743/875 (84.9%)	4424/5673 (78%)	1057/1426 (74.1%)
70-79	9433/10706 (88.1%)	711/765 (92.9%)	2289/2494 (91.8%)	787/863 (91.2%)	4551/5291 (86%)	1095/1293 (84.7%)
80+	7418/7999 (92.7%)	443/465 (95.3%)	2059/2158 (95.4%)	616/648 (95.1%)	3597/3963 (90.8%)	703/765 (91.9%)

eTable 18. Hospitalisations and ICU admissions per hospital and ICU beds in Brazil and regions*

	Brazil		North		Northeast		Central-West		Southeast		South	
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
All hospitalizations (n/per 100,000 hospital beds)	232036/ 356344	65116	13496/ 23719	56900	45238/ 87604	51639	17012/ 29606	57461	131556/ 157510	83522	24734/ 57905	42715
ICU admissions (n/per 1,000 ICU beds)	79687/ 37692	2114	3786/ 1686	2246	14867/ 7171	2073	6682/ 3340	2001	45224/ 20403	2217	9128/ 5092	1793

* Beds data on February 2020.

eFigure 5. Proportion of intensive care unit admission and use of invasive mechanical ventilation stratified by age in hospitalised COVID-19 patients in the five regions of Brazil.



eTable 19. Use of resources in terms of proportions of hospitalised patients admitted to the ICU and under invasive mechanical ventilation stratified by age and region

Proportion of ICU admission

	Brazil	North	Northeast	Central-West	Southeast	South
Total	79687/205493 (38.8%)	3786/11973 (31.6%)	14867/34532 (43.1%)	6682/16035 (41.7%)	45224/119083 (38%)	9128/23870 (38.2%)
Age groups						
20-39	7512/27309 (27.5%)	334/1773 (18.8%)	1279/4144 (30.9%)	732/2354 (31.1%)	4354/15772 (27.6%)	813/3266 (24.9%)
40-49	9478/30353 (31.2%)	404/1748 (23.1%)	1440/4225 (34.1%)	890/2618 (34%)	5630/18181 (31%)	1114/3581 (31.1%)
50-59	14034/38720 (36.2%)	645/2031 (31.8%)	2324/5698 (40.8%)	1266/3182 (39.8%)	8097/23092 (35.1%)	1702/4717 (36.1%)
60-69	18058/42617 (42.4%)	950/2482 (38.3%)	3318/7024 (47.2%)	1420/3221 (44.1%)	10094/24709 (40.9%)	2276/5181 (43.9%)
70-79	16848/36423 (46.3%)	891/2322 (38.4%)	3401/7010 (48.5%)	1345/2679 (50.2%)	9264/20304 (45.6%)	1947/4108 (47.4%)
80+	13757/30071 (45.7%)	562/1617 (34.8%)	3105/6431 (48.3%)	1029/1981 (51.9%)	7785/17025 (45.7%)	1276/3017 (42.3%)

Proportion on invasive mechanical ventilation

	Brazil	North	Northeast	Central-West	Southeast	South
Total	45205/196248 (23%)	3155/10945 (28.8%)	10322/32984 (31.3%)	3667/15304 (24%)	22648/113848 (19.9%)	5413/23167 (23.4%)
Age groups						
20-39	3278/25871 (12.7%)	250/1644 (15.2%)	791/3995 (19.8%)	279/2245 (12.4%)	1559/14846 (10.5%)	399/3141 (12.7%)
40-49	4488/28766 (15.6%)	334/1616 (20.7%)	947/4005 (23.6%)	397/2479 (16%)	2239/17206 (13%)	571/3460 (16.5%)
50-59	7586/37004 (20.5%)	520/1836 (28.3%)	1579/5468 (28.9%)	605/3035 (19.9%)	3923/22070 (17.8%)	959/4595 (20.9%)
60-69	11148/40811 (27.3%)	821/2237 (36.7%)	2353/6699 (35.1%)	875/3082 (28.4%)	5673/23756 (23.9%)	1426/5037 (28.3%)
70-79	10706/34913 (30.7%)	765/2130 (35.9%)	2494/6690 (37.3%)	863/2566 (33.6%)	5291/19524 (27.1%)	1293/4003 (32.3%)
80+	7999/28883 (27.7%)	465/1482 (31.4%)	2158/6127 (35.2%)	648/1897 (34.2%)	3963/16446 (24.1%)	765/2931 (26.1%)

eTable 20. Patients characteristics stratified by region (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

Variables	Brazil (n=314,615)	North (n=27,502)	Northeast (n=71,442)	Central-West (n=23,908)	Southeast (n=162,563)	South (n=29,200)
Age, mean (sd) [n = 314615 (100%)]	60 (17)	59 (18)	62 (18)	58 (17)	60 (17)	59 (17)
median (IQR)	61 (48, 73)	60 (46, 73)	64 (49, 76)	58 (46, 71)	61 (48, 73)	60 (47, 72)
Age group, N (%)						
20-39	42390 (13%)	4527 (16%)	9201 (13%)	3642 (15%)	21019 (13%)	4001 (14%)
40-49	45773 (15%)	4063 (15%)	8992 (13%)	3967 (17%)	24312 (15%)	4439 (15%)
50-59	58569 (19%)	4697 (17%)	11893 (17%)	4832 (20%)	31330 (19%)	5817 (20%)
60-69	65266 (21%)	5603 (20%)	14359 (20%)	4785 (20%)	34158 (21%)	6361 (22%)
70-79	56297 (18%)	5011 (18%)	14366 (20%)	3880 (16%)	28105 (17%)	4935 (17%)
80+	46320 (15%)	3601 (13%)	12631 (18%)	2802 (12%)	23639 (15%)	3647 (12%)
Male sex, No. (%) [n = 314556 (100%)]	177819 (57%)	16317 (59%)	39937 (56%)	13710 (57%)	91307 (56%)	16548 (57%)
Self-reported race, No. (%) [n = 229079 (73%)]^a						
White	104274 (46%)	2419 (10%)	7292 (15%)	4349 (29%)	67763 (57%)	22451 (88%)
Black/Brown	120326 (53%)	19877 (86%)	38811 (82%)	10071 (67%)	48864 (41%)	2703 (11%)
Asian	3511 (1.5%)	333 (1.4%)	908 (1.9%)	310 (2.1%)	1802 (1.5%)	158 (0.6%)
Indigenous	968 (0.4%)	447 (1.9%)	139 (0.3%)	225 (1.5%)	98 (<0.1%)	59 (0.2%)
Level of education, No. (%) [n = 109128 (35%)]						
Illiterate	8084 (7.4%)	1734 (13%)	2728 (15%)	396 (5.7%)	2682 (4.7%)	544 (4.0%)
Up to high school	49609 (45%)	6131 (45%)	7790 (44%)	2926 (42%)	25914 (45%)	6848 (51%)
High school	34909 (32%)	4274 (31%)	4995 (28%)	2371 (34%)	19312 (34%)	3957 (29%)
College/University	16526 (15%)	1620 (12%)	2334 (13%)	1271 (18%)	9184 (16%)	2117 (16%)
Number of comorbidities, No. (%) [n = 111589 (35%)]^b						
0	18705 (17%)	1675 (20%)	3846 (17%)	2088 (20%)	8928 (16%)	2168 (16%)
1-2	83320 (75%)	6361 (75%)	16895 (76%)	7680 (73%)	42400 (75%)	9984 (73%)
≥3	9564 (8.6%)	425 (5.0%)	1607 (7.2%)	756 (7.2%)	5306 (9.4%)	1470 (11%)
Oxygen saturation < 95%, No. (%) [n = 261862 (83%)]	181336 (69%)	15430 (67%)	37291 (68%)	13928 (64%)	97090 (71%)	17597 (67%)
Dyspnoea, No. (%) [n = 280719 (89%)]	224655 (80%)	21220 (84%)	51329 (83%)	17532 (78%)	112723 (78%)	21851 (79%)
Respiratory distress, No. (%) [n = 259205 (82%)]	179444 (69%)	18568 (78%)	37211 (70%)	14538 (67%)	91374 (68%)	17753 (68%)
SARI criteria, No. (%) [n = 260790 (83%)]	159444 (61%)	18556 (76%)	35926 (66%)	11950 (56%)	79075 (59%)	13937 (54%)
SARI without fever criteria, No. (%) [n = 275676 (88%)]	211673 (77%)	21121 (84%)	46362 (78%)	15986 (72%)	108369 (76%)	19835 (73%)
Hospitalization in state capital, No. (%) [n = 314615 (100%)]	162333 (52%)	13938 (51%)	45441 (64%)	15856 (66%)	78357 (48%)	8741 (30%)

The numbers and proportions within brackets refer to the available data for each variable.

SD – Standard deviation; SARI – Severe acute respiratory infection

a Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

b Number of chronic comorbidities is the sum of the following comorbidities: cardiovascular, diabetes, renal, neurologic, hematologic, hepatic, chronic respiratory disorder, obesity, immunosuppression.

eTable 21. Times of the disease, intensive care admissions and need of respiratory support among patients with a defined hospital outcome (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

	Brazil (n=284,747)	North (n=25061)	Northeast (n=61322)	Central-West (n=21186)	Southeast (n=149384)	South (n=27794)
ICU, No. (%)						
ICU admission [n = 251620 (88%)]	94948 (38%)	6118 (28%)	19495 (41%)	7701 (39%)	51663 (38%)	9971 (37%)
Respiratory support, No. (%) [n=240084; 84%]						
No support	65310 (27%)	5621 (28%)	11301 (25%)	5040 (27%)	36362 (28%)	6986 (27%)
Yes, non-invasive	119717 (50%)	9859 (48%)	20958 (46%)	9470 (50%)	66356 (52%)	13074 (50%)
Place of non-invasive respiratory support [n = 113543 (95%)] ^a						
In ICU	32005 (28%)	1375 (14%)	5113 (26%)	2589 (29%)	19293 (31%)	3635 (28%)
Outside ICU	81538 (72%)	8153 (86%)	14386 (74%)	6480 (71%)	43286 (69%)	9233 (72%)
Yes, invasive	55057 (23%)	4950 (24%)	13766 (30%)	4430 (23%)	25967 (20%)	5944 (23%)
Place of invasive respiratory support, N (%) [n=53591, 97%] ^a						
In ICU	45997 (86%)	3963 (82%)	11135 (84%)	3550 (82%)	21912 (87%)	5437 (92%)
Outside ICU	7594 (14%)	895 (18%)	2127 (16%)	796 (18%)	3297 (13%)	479 (8.1%)
Hospitalisation						
Hospital mortality, No. (%) [n=284747 (100%); 100%]	108566 (38%)	11099 (44%)	28929 (47%)	7278 (34%)	52777 (35%)	8483 (31%)
Length-of-Stay						
Hospital length-of-stay, median (IQR) [n=267418; 94%]	8 (4, 14)	7 (3, 14)	8 (4, 15)	8 (4, 14)	8 (4, 14)	8 (4, 14)
ICU LOS, median (IQR) [n = 51777 (55%)]	7 (3, 14)	6 (3, 12)	6 (3, 13)	7 (3, 13)	7 (3, 14)	9 (4, 17)
Time from onset of symptoms, median (IQR)						
to hospital admission [n = 248829 (87%)]	7 (4, 10)	7 (5, 11)	7 (4, 10)	7 (4, 10)	6 (4, 9)	6 (4, 9)
to ICU admission [n = 85714 (90%)]	7 (4, 10)	9 (5, 13)	7 (4, 11)	7 (5, 11)	7 (4, 10)	7 (4, 10)
to death [n = 106727 (98%)]	15 (9, 23)	14 (8, 21)	14 (8, 22)	16 (10, 25)	15 (9, 23)	17 (10, 25)
Time from hospital admission to death [n = 99041 (91%)]	9 (4, 17)	7 (3, 13)	8 (4, 16)	10 (5, 18)	10 (5, 17)	11 (6, 20)

The numbers and proportions in brackets refer to the available data for each variable.

ICU – intensive care unit

a The sum of non-invasive and invasive respiratory support when stratified by place - in ICU and outside ICU – does not match the total respiratory support type because of missing values on the variable ICU admission.

eTable 22. In-hospital mortality stratified by age and sex in Brazil (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

	Total	By age
Total	284747	108566/284747 (38%)
Age groups		
20-39	37557	4726/37557 (13%)
40-49	40980	7650/40980 (19%)
50-59	52599	14590/52599 (28%)
60-69	59222	25123/59222 (42%)
70-79	51503	28166/51503 (55%)
80+	42886	28311/42886 (66%)

	Total	Female	Male
Total	284697	45418/123502 (37%)	63134/161195 (39%)
Age groups			
20-39	37545	1977/17242 (11%)	2748/20303 (14%)
40-49	40971	2764/15541 (18%)	4886/25430 (19%)
50-59	52591	5361/20788 (26%)	9227/31803 (29%)
60-69	59208	9699/24736 (39%)	15417/34472 (45%)
70-79	51499	11569/22826 (51%)	16595/28673 (58%)
80+	42883	14048/22369 (63%)	14261/20514 (70%)

eTable 23. In-hospital mortality stratified by chronic comorbidities, level of education, self-reported race, and age (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

Comorbidities

	Total	No Comorbidity	1-2 Comorbidities	≥ 3 Comorbidities
Total	102788	5649/17154 (33%)	33113/76635 (43%)	5372/8999 (60%)
Age groups				
20-39	8252	381/2815 (14%)	1125/5134 (22%)	128/303 (42%)
40-49	11452	483/2587 (19%)	1978/8226 (24%)	280/639 (44%)
50-59	18669	780/3278 (24%)	4206/13915 (30%)	687/1476 (47%)
60-69	24193	1193/3334 (36%)	7757/18473 (42%)	1360/2386 (57%)
70-79	22021	1354/2762 (49%)	9069/16953 (53%)	1524/2306 (66%)
80+	18201	1458/2378 (61%)	8978/13934 (64%)	1393/1889 (74%)

Self-reported race *

	Total	White	Black/Brown	Asian	Indigenous
Total	208812	35218/96976 (36%)	45520/107793 (42%)	1260/3149 (40%)	392/894 (44%)
Age groups					
20-39	27256	1201/12024 (10%)	2346/14733 (16%)	49/370 (13%)	21/129 (16%)
40-49	29353	2040/13127 (16%)	3662/15724 (23%)	74/374 (20%)	29/128 (23%)
50-59	38190	4231/17638 (24%)	6603/19868 (33%)	146/523 (28%)	60/161 (37%)
60-69	43752	7878/20159 (39%)	10910/22742 (48%)	277/682 (41%)	75/169 (44%)
70-79	38537	9333/17944 (52%)	11751/19793 (59%)	343/656 (52%)	89/144 (62%)
80+	31724	10535/16084 (65%)	10248/14933 (69%)	371/544 (68%)	118/163 (72%)

* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

Level of education

	Total	Illiterate	Up to high school	High school	College/University
Total	100107	4558/7397 (62%)	21069/45781 (46%)	9613/31949 (30%)	3569/14980 (24%)
Age groups					
20-39	14770	63/182 (35%)	580/3003 (19%)	929/7779 (12%)	285/3806 (7%)
40-49	15159	109/278 (39%)	1141/4698 (24%)	1239/6924 (18%)	402/3259 (12%)
50-59	18903	256/590 (43%)	2690/8524 (32%)	1875/6808 (28%)	588/2981 (20%)
60-69	20415	727/1306 (56%)	5228/11380 (46%)	2300/5222 (44%)	867/2507 (35%)
70-79	17128	1367/2204 (62%)	5963/10339 (58%)	1805/3105 (58%)	755/1480 (51%)
80+	13732	2036/2837 (72%)	5467/7837 (70%)	1465/2111 (69%)	672/947 (71%)

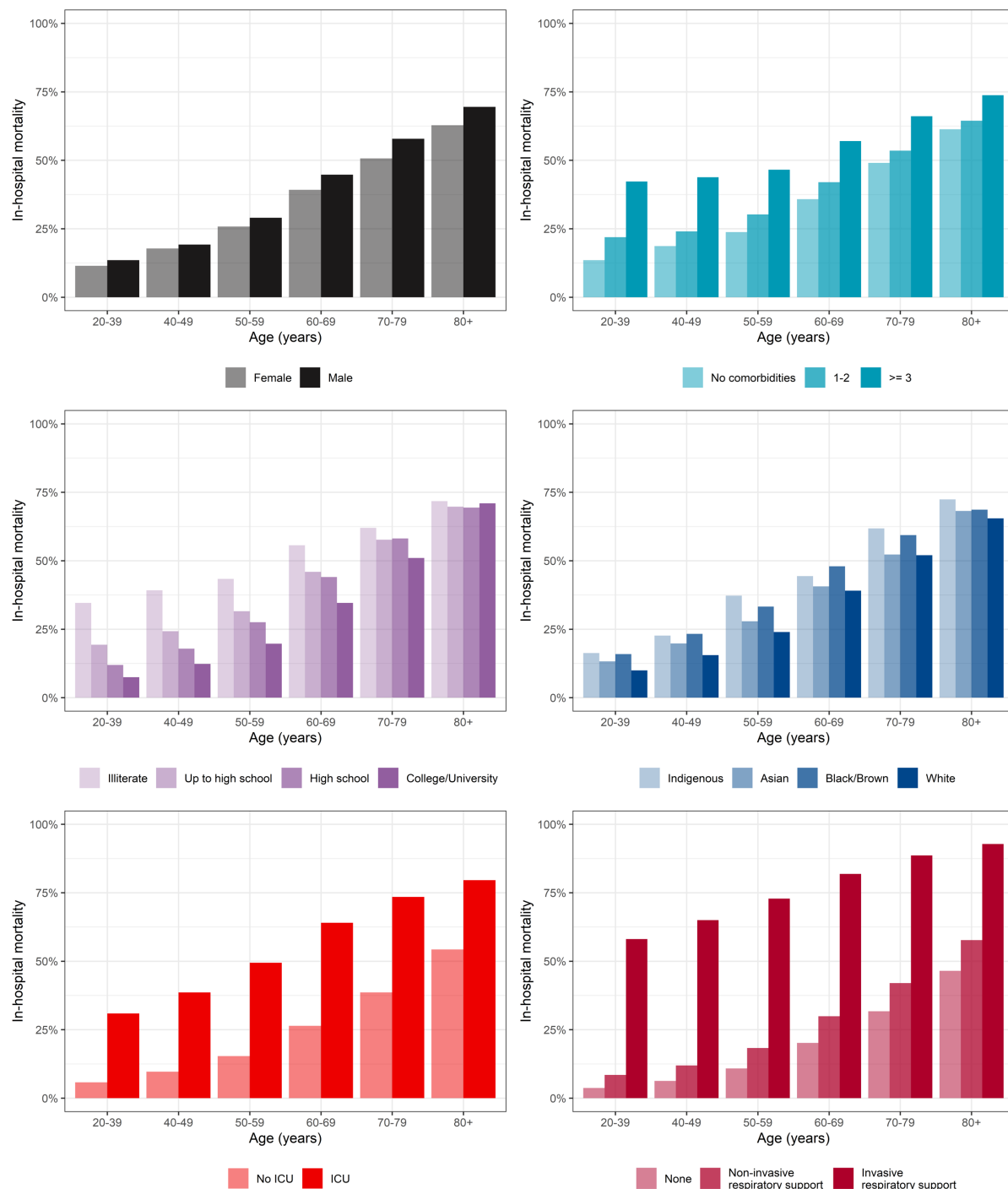
eTable 24. In-hospital mortality stratified by ICU admission, respiratory support and age
(Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

	Total	No ICU admission	ICU admission
Total	251620	37515/156672 (24%)	57175/94948 (60%)
Age groups			
20-39	33297	1414/24466 (6%)	2732/8831 (31%)
40-49	36490	2456/25452 (10%)	4262/11038 (39%)
50-59	46899	4663/30397 (15%)	8159/16502 (49%)
60-69	52261	8102/30703 (26%)	13804/21558 (64%)
70-79	45196	9591/24855 (39%)	14945/20341 (73%)
80+	37477	11289/20799 (54%)	13273/16678 (80%)

	Total	No respiratory support	Non-invasive ventilation	Invasive mechanical ventilation
Total	240084	10846/65310 (17%)	35042/119717 (29%)	44360/55057 (81%)
Age groups				
20-39	31548	515/13802 (4%)	1171/13787 (8%)	2299/3959 (58%)
40-49	34600	750/11946 (6%)	2053/17218 (12%)	3534/5436 (65%)
50-59	44743	1368/12602 (11%)	4216/23039 (18%)	6629/9102 (73%)
60-69	49991	2315/11486 (20%)	7463/24970 (30%)	11080/13535 (82%)
70-79	43272	2784/8772 (32%)	8971/21347 (42%)	11655/13153 (89%)
80+	35930	3114/6702 (46%)	11168/19356 (58%)	9163/9872 (93%)

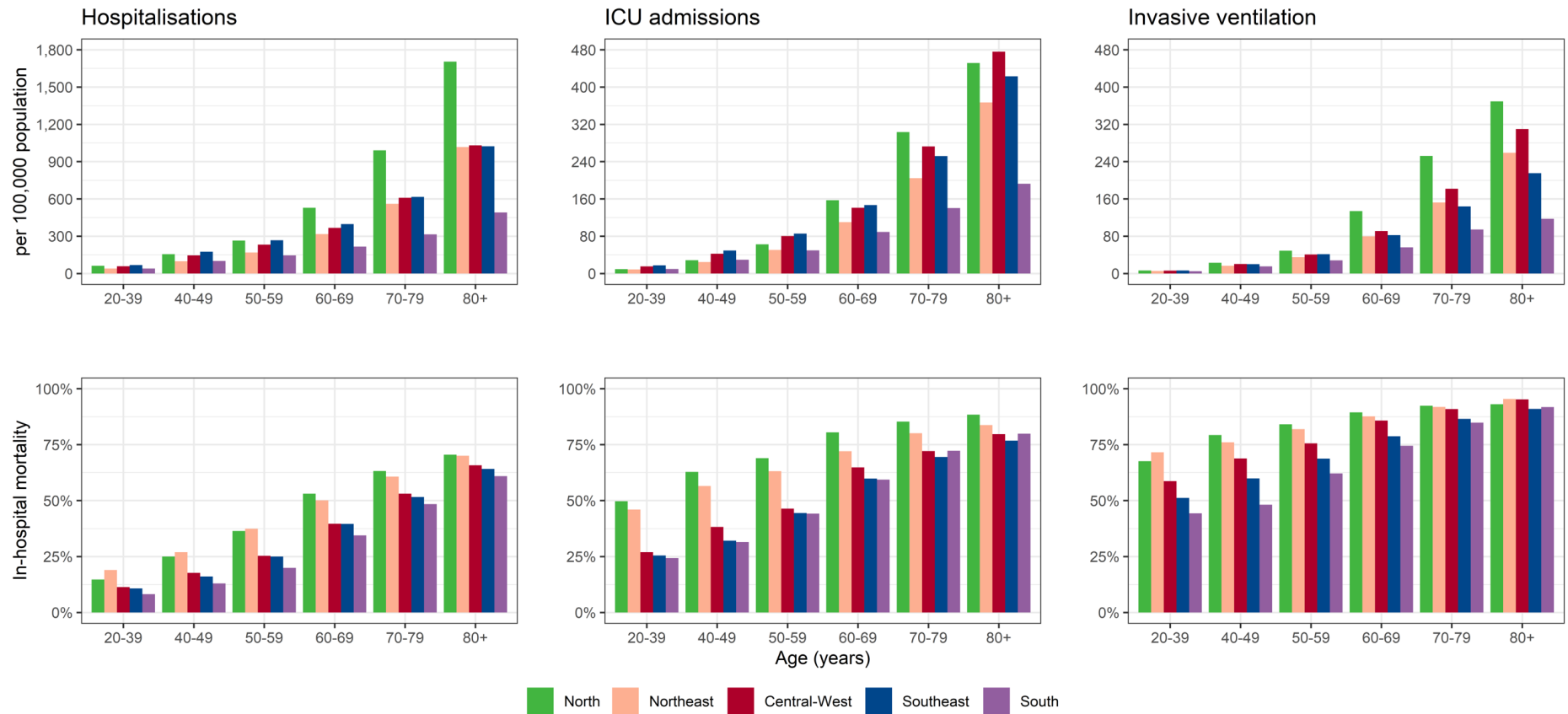
	Total	No respiratory support		Non-invasive ventilation		Invasive mechanical ventilation	
		No ICU	ICU	No ICU	ICU	No ICU	ICU
Total	230728	7706/53703 (14%)	2747/9891 (28%)	20310/81538 (25%)	12632/32005 (39%)	5629/7594 (74%)	37545/45997 (82%)
Age groups							
20-39	30548	362/11863 (3%)	136/1612 (8%)	647/9856 (7%)	454/3347 (14%)	265/589 (45%)	1977/3281 (60%)
40-49	33350	556/10068 (6%)	159/1565 (10%)	1153/12274 (9%)	777/4147 (19%)	443/839 (53%)	3006/4457 (67%)
50-59	43067	977/10447 (9%)	339/1827 (19%)	2373/16075 (15%)	1597/5837 (27%)	838/1249 (67%)	5632/7632 (74%)
60-69	47935	1641/9381 (17%)	573/1791 (32%)	4212/16798 (25%)	2804/6805 (41%)	1374/1773 (77%)	9392/11387 (82%)
70-79	41472	1965/6874 (29%)	727/1654 (44%)	5185/14038 (37%)	3224/6100 (53%)	1432/1697 (84%)	9921/11109 (89%)
80+	34356	2205/5070 (43%)	813/1442 (56%)	6740/12497 (54%)	3776/5769 (65%)	1277/1447 (88%)	7617/8131 (94%)

eFigure 6. In-hospital mortality stratified by age, sex, comorbidities, level of education, self-reported race *, intensive care admission and invasive mechanical ventilation for hospitalized COVID-19 patients in Brazil (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)



* Race was collected as self-reported race or skin colour, originally classified as White (Branco), Black (Preto), Brown (Pardo), Asian (Amarelo), and Indigenous (Indígena)

eFigure 7. Health system burden and in-hospital mortality stratified by age in hospitalised COVID-19 patients in the five regions of Brazil (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)



eTable 25. Health system burden in Brazil and its regions (number / per 100,000 inhabitants) (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

Hospitalisations per population

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	284747/151778729	187.6	25061/12049813	208.0	61322/39882347	153.8	21186/11678574	181.4	149384/65803414	227.0	27794/22364581	124.3
Age groups												
20-39	37557/68451093	54.9	3976/6448447	61.7	7596/19048242	39.9	3156/5484644	57.5	19060/28059711	67.9	3769/9410049	40.1
40-49	40980/29255478	140.1	3662/2357103	155.4	7516/7654000	98.2	3483/2386731	145.9	22137/12717264	174.1	4182/4140380	101.0
50-59	52599/23875081	220.3	4226/1600270	264.1	10000/5930317	168.6	4226/1825822	231.5	28625/10724660	266.9	5522/3794012	145.5
60-69	59222/16732972	353.9	5150/974828	528.3	12343/3893805	317.0	4241/1155857	366.9	31455/7919342	397.2	6033/2789140	216.3
70-79	51503/9023052	570.8	4657/470277	990.3	12572/2245607	559.8	3499/575162	608.4	26037/4225114	616.2	4738/1506892	314.4
80+	42886/4441053	965.7	3390/198888	1704.5	11295/1110376	1017.2	2581/250358	1030.9	22070/2157323	1023.0	3550/724108	490.3

ICU admissions per population

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	94948/151778729	62.6	6118/12049813	50.8	19495/39882347	48.9	7701/11678574	65.9	51663/65803414	78.5	9971/22364581	44.6
Age groups												
20-39	8831/68451093	12.9	590/6448447	9.1	1661/19048242	8.7	836/5484644	15.2	4854/28059711	17.3	890/9410049	9.5
40-49	11038/29255478	37.7	672/2357103	28.5	1881/7654000	24.6	1010/2386731	42.3	6265/12717264	49.3	1210/4140380	29.2
50-59	16502/23875081	69.1	1001/1600270	62.6	2999/5930317	50.6	1468/1825822	80.4	9154/10724660	85.4	1880/3794012	49.6
60-69	21558/16732972	128.8	1531/974828	157.1	4288/3893805	110.1	1628/1155857	140.8	11626/7919342	146.8	2485/2789140	89.1
70-79	20341/9023052	225.4	1426/470277	303.2	4594/2245607	204.6	1568/575162	272.6	10640/4225114	251.8	2113/1506892	140.2
80+	16678/4441053	375.5	898/198888	451.5	4072/1110376	366.7	1191/250358	475.7	9124/2157323	422.9	1393/724108	192.4

Hospitalisations requiring invasive mechanical ventilation per population

	Brazil		North		Northeast		Central-West		Southeast		South	
Total	55057/151778729	36.3	4950/12049813	41.1	13766/39882347	34.5	4430/11678574	37.9	25967/65803414	39.5	5944/22364581	26.6
Age groups												
20-39	3959/68451093	5.8	407/6448447	6.3	1035/19048242	5.4	329/5484644	6.0	1757/28059711	6.3	431/9410049	4.6
40-49	5436/29255478	18.6	540/2357103	22.9	1261/7654000	16.5	481/2386731	20.2	2531/12717264	19.9	623/4140380	15.0
50-59	9102/23875081	38.1	779/1600270	48.7	2071/5930317	34.9	745/1825822	40.8	4446/10724660	41.5	1061/3794012	28.0
60-69	13535/16732972	80.9	1304/974828	133.8	3105/3893805	79.7	1053/1155857	91.1	6512/7919342	82.2	1561/2789140	56.0
70-79	13153/9023052	145.8	1186/470277	252.2	3420/2245607	152.3	1046/575162	181.9	6082/4225114	143.9	1419/1506892	94.2
80+	9872/4441053	222.3	734/198888	369.1	2874/1110376	258.8	776/250358	310.0	4639/2157323	215.0	849/724108	117.2

eTable 26. Overall in-hospital mortality, among those admitted to the ICU or under invasive mechanical ventilation, stratified by age and Brazilian regions (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

In-hospital mortality (Overall)

	Brazil	North	Northeast	Central-West	Southeast	South
Total	108566/284747 (38.1%)	11099/25061 (44.3%)	28929/61322 (47.2%)	7278/21186 (34.4%)	52777/149384 (35.3%)	8483/27794 (30.5%)
Age groups						
20-39	4726/37557 (12.6%)	584/3976 (14.7%)	1439/7596 (18.9%)	358/3156 (11.3%)	2038/19060 (10.7%)	307/3769 (8.1%)
40-49	7650/40980 (18.7%)	914/3662 (25%)	2026/7516 (27%)	615/3483 (17.7%)	3553/22137 (16.1%)	542/4182 (13%)
50-59	14590/52599 (27.7%)	1537/4226 (36.4%)	3740/10000 (37.4%)	1069/4226 (25.3%)	7143/28625 (25%)	1101/5522 (19.9%)
60-69	25123/59222 (42.4%)	2733/5150 (53.1%)	6183/12343 (50.1%)	1681/4241 (39.6%)	12449/31455 (39.6%)	2077/6033 (34.4%)
70-79	28166/51503 (54.7%)	2942/4657 (63.2%)	7634/12572 (60.7%)	1858/3499 (53.1%)	13438/26037 (51.6%)	2294/4738 (48.4%)
80+	28311/42886 (66%)	2389/3390 (70.5%)	7907/11295 (70%)	1697/2581 (65.7%)	14156/22070 (64.1%)	2162/3550 (60.9%)

In-hospital mortality (ICU admissions)

	Brazil	North	Northeast	Central-West	Southeast	South
Total	57175/94948 (60.2%)	4647/6118 (76%)	13899/19495 (71.3%)	4427/7701 (57.5%)	28661/51663 (55.5%)	5541/9971 (55.6%)
Age groups						
20-39	2732/8831 (30.9%)	293/590 (49.7%)	764/1661 (46%)	225/836 (26.9%)	1234/4854 (25.4%)	216/890 (24.3%)
40-49	4262/11038 (38.6%)	422/672 (62.8%)	1063/1881 (56.5%)	386/1010 (38.2%)	2010/6265 (32.1%)	381/1210 (31.5%)
50-59	8159/16502 (49.4%)	690/1001 (68.9%)	1893/2999 (63.1%)	681/1468 (46.4%)	4065/9154 (44.4%)	830/1880 (44.1%)
60-69	13804/21558 (64%)	1232/1531 (80.5%)	3090/4288 (72.1%)	1055/1628 (64.8%)	6952/11626 (59.8%)	1475/2485 (59.4%)
70-79	14945/20341 (73.5%)	1216/1426 (85.3%)	3678/4594 (80.1%)	1131/1568 (72.1%)	7394/10640 (69.5%)	1526/2113 (72.2%)
80+	13273/16678 (79.6%)	794/898 (88.4%)	3411/4072 (83.8%)	949/1191 (79.7%)	7006/9124 (76.8%)	1113/1393 (79.9%)

In-hospital mortality (Invasive mechanical ventilation)

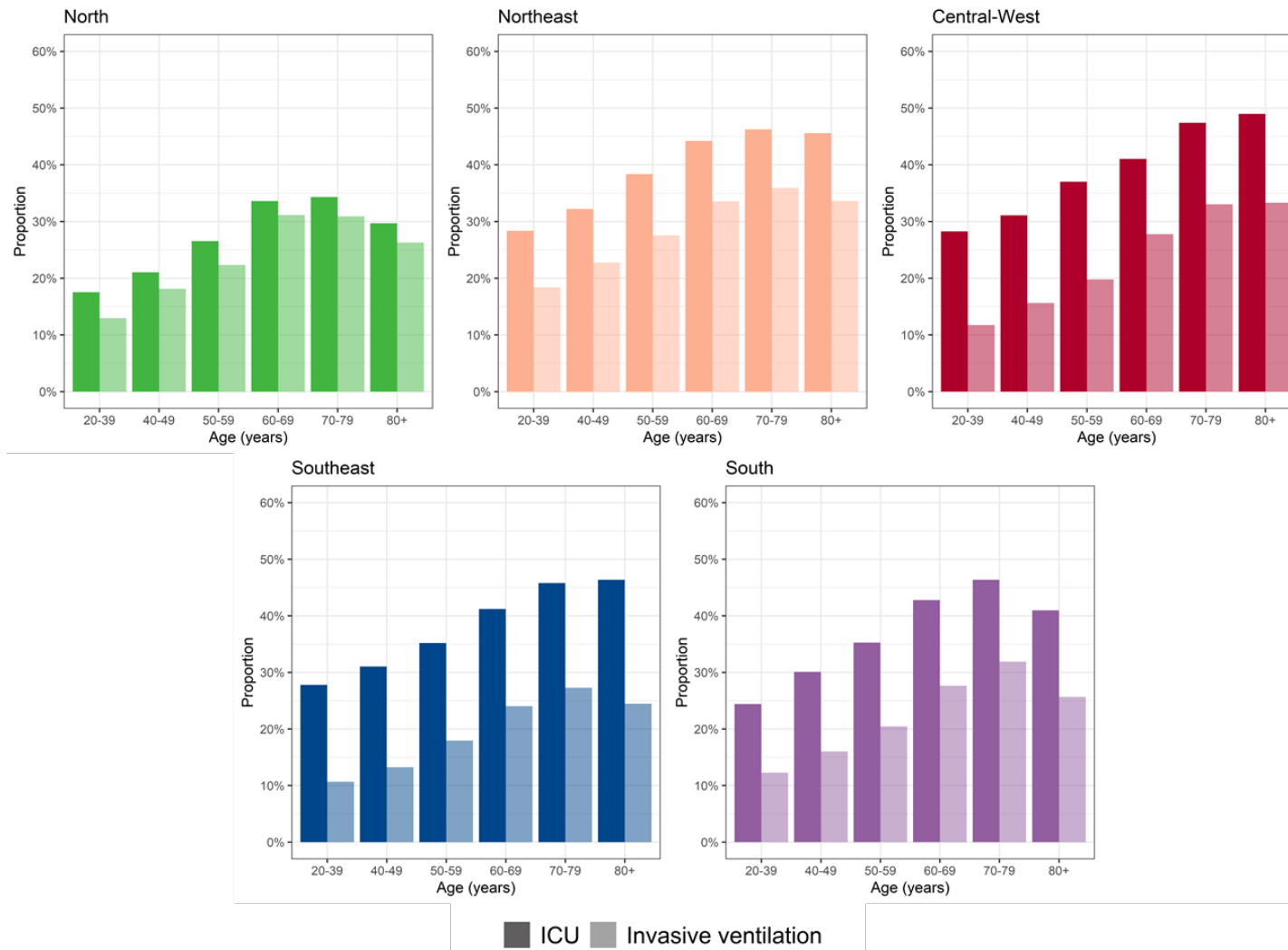
	Brazil	North	Northeast	Central-West	Southeast	South
Total	44360/55057 (80.6%)	4303/4950 (86.9%)	12004/13766 (87.2%)	3680/4430 (83.1%)	20077/25967 (77.3%)	4296/5944 (72.3%)
Age groups						
20-39	2299/3959 (58.1%)	275/407 (67.6%)	741/1035 (71.6%)	193/329 (58.7%)	899/1757 (51.2%)	191/431 (44.3%)
40-49	3534/5436 (65%)	428/540 (79.3%)	959/1261 (76.1%)	331/481 (68.8%)	1516/2531 (59.9%)	300/623 (48.2%)
50-59	6629/9102 (72.8%)	655/779 (84.1%)	1697/2071 (81.9%)	563/745 (75.6%)	3055/4446 (68.7%)	659/1061 (62.1%)
60-69	11080/13535 (81.9%)	1166/1304 (89.4%)	2722/3105 (87.7%)	903/1053 (85.8%)	5126/6512 (78.7%)	1163/1561 (74.5%)
70-79	11655/13153 (88.6%)	1096/1186 (92.4%)	3142/3420 (91.9%)	951/1046 (90.9%)	5262/6082 (86.5%)	1204/1419 (84.8%)
80+	9163/9872 (92.8%)	683/734 (93.1%)	2743/2874 (95.4%)	739/776 (95.2%)	4219/4639 (90.9%)	779/849 (91.8%)

eTable 27. Hospitalisations and ICU admissions per hospital and ICU beds in Brazil and regions (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)*

	Brazil		North		Northeast		Central-West		Southeast		South	
	N	rate	N	rate	N	rate	N	rate	N	rate	N	rate
All hospitalizations (n/per 100,000 hospital beds)	28474/ 356344	79,908	2506/ 23719	105,658	61322/ 87604	69,999	21186/ 29606	71,560	149384/1 57510	94,841	18525/ 57905	31,992
ICU admissions (n/per 1000 ICU beds)	94948/ 37692	2,519	6118/ 1686	3,629	19495/ 7171	2,719	7701/ 3340	2,306	51663/ 20403	2,532	9971/ 5092	1,958

* Beds data on February 2020

eFigure 8. Proportion of intensive care unit admission and use of mechanical ventilation stratified by age in hospitalised COVID-19 patients in the five regions of Brazil (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)



eTable 28. Use of resources in terms of proportions of hospitalised patients admitted to the ICU and under invasive mechanical ventilation stratified by age and region (Sensitivity Analysis: patients with laboratorial and clinical diagnosis of COVID-19)

Proportion of ICU admission

	Brazil	North	Northeast	Central-West	Southeast	South
Total	94948/251620 (37.7%)	6118/22070 (27.7%)	19495/48095 (40.5%)	7701/19886 (38.7%)	51663/134801 (38.3%)	9971/26768 (37.2%)
Age groups						
20-39	8831/33297 (26.5%)	590/3367 (17.5%)	1661/5859 (28.3%)	836/2960 (28.2%)	4854/17465 (27.8%)	890/3646 (24.4%)
40-49	11038/36490 (30.2%)	672/3194 (21%)	1881/5840 (32.2%)	1010/3249 (31.1%)	6265/20185 (31%)	1210/4022 (30.1%)
50-59	16502/46899 (35.2%)	1001/3771 (26.5%)	2999/7822 (38.3%)	1468/3967 (37%)	9154/26007 (35.2%)	1880/5332 (35.3%)
60-69	21558/52261 (41.3%)	1531/4557 (33.6%)	4288/9704 (44.2%)	1628/3969 (41%)	11626/28222 (41.2%)	2485/5809 (42.8%)
70-79	20341/45196 (45%)	1426/4156 (34.3%)	4594/9933 (46.2%)	1568/3308 (47.4%)	10640/23240 (45.8%)	2113/4559 (46.3%)
80+	16678/37477 (44.5%)	898/3025 (29.7%)	4072/8937 (45.6%)	1191/2433 (49%)	9124/19682 (46.4%)	1393/3400 (41%)

Proportion on invasive mechanical ventilation

	Brazil	North	Northeast	Central-West	Southeast	South
Total	55057/240084 (22.9%)	4950/20430 (24.2%)	13766/46025 (29.9%)	4430/18940 (23.4%)	25967/128685 (20.2%)	5944/26004 (22.9%)
Age groups						
20-39	3959/31548 (12.5%)	407/3142 (13%)	1035/5627 (18.4%)	329/2806 (11.7%)	1757/16456 (10.7%)	431/3517 (12.3%)
40-49	5436/34600 (15.7%)	540/2980 (18.1%)	1261/5546 (22.7%)	481/3079 (15.6%)	2531/19105 (13.2%)	623/3890 (16%)
50-59	9102/44743 (20.3%)	779/3491 (22.3%)	2071/7520 (27.5%)	745/3766 (19.8%)	4446/24774 (17.9%)	1061/5192 (20.4%)
60-69	13535/49991 (27.1%)	1304/4186 (31.2%)	3105/9262 (33.5%)	1053/3792 (27.8%)	6512/27103 (24%)	1561/5648 (27.6%)
70-79	13153/43272 (30.4%)	1186/3839 (30.9%)	3420/9520 (35.9%)	1046/3168 (33%)	6082/22295 (27.3%)	1419/4450 (31.9%)
80+	9872/35930 (27.5%)	734/2792 (26.3%)	2874/8550 (33.6%)	776/2329 (33.3%)	4639/18952 (24.5%)	849/3307 (25.7%)

eTable 29. In-hospital mortality by comorbidities numbers, ICU admission and respiratory support in main analysis and multiple imputed data in Brazil (sensitivity analysis)

	Original (complete cases)	Imputed values
Number of comorbidities		
0	4494/13836 (32%)	24.6%
1-2	26933/62766 (43%)	35.9%
≥3	4685/7798 (60%)	48.7%
Respiratory Support		
None	8655/54314 (16%)	16.4%
Yes, non-invasive	28287/96729 (29%)	29.7%
Yes, invasive	36046/45205 (80%)	80.0%
ICU admission	47002/79687 (59%)	59.4%

eTable 30. In-hospital mortality by comorbidities numbers and age in main analysis and multiple imputed data in Brazil (sensitivity analysis)

	Total	No Comorbidity	1-2 Comorbidities	≥ 3 Comorbidities
Age groups				
20-39	6780	291/2245 (13%)	937/4278 (22%)	104/257 (40%)
40-49	9547	396/2171 (18%)	1591/6824 (23%)	243/552 (44%)
50-59	15438	625/2691 (23%)	3432/11484 (30%)	594/1263 (47%)
60-69	19886	951/2691 (35%)	6300/15112 (42%)	1187/2083 (57%)
70-79	17957	1051/2165 (49%)	7360/13772 (53%)	1349/2020 (67%)
80+	14792	1180/1873 (63%)	7313/11296 (65%)	1208/1623 (74%)
Multiple imputed				
		No Comorbidity	1-2 Comorbidities	≥ 3 Comorbidities
Age groups				
20-39		7.9%	12.2%	19.0%
40-49		13.3%	16.8%	25.9%
50-59		20.4%	24.9%	37.0%
60-69		34.5%	38.7%	52.4%
70-79		48.5%	51.5%	62.9%
80+		63%	63.9%	71.7%

eTable 31. In-hospital mortality by comorbidities numbers, ICU admission and respiratory support in main analysis and multiple imputed data stratified by age (sensitivity analysis)

In-hospital mortality (ICU admissions)

	North		Northeast		Central-West		Southeast		South	
	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed
Age groups										
20-39	195/334 (58.4%)	57.5%	579/1279 (45.3%)	42.1%	185/732 (25.3%)	25.4%	1065/4354 (24.5%)	24.6%	201/813 (24.7%)	24.6%
40-49	265/404 (65.6%)	65.7%	799/1440 (55.5%)	52.4%	324/890 (36.4%)	36.3%	1763/5630 (31.3%)	31.5%	352/1114 (31.6%)	31.5%
50-59	468/645 (72.6%)	72.8%	1441/2324 (62%)	60.5%	554/1266 (43.8%)	44.1%	3513/8097 (43.4%)	43.6%	756/1702 (44.4%)	44.3%
60-69	800/950 (84.2%)	84.1%	2350/3318 (70.8%)	70.8%	896/1420 (63.1%)	62.7%	5980/10094 (59.2%)	59.5%	1346/2276 (59.1%)	59.1%
70-79	779/891 (87.4%)	87.7%	2720/3401 (80%)	79.4%	954/1345 (70.9%)	70.9%	6408/9264 (69.2%)	69.4%	1396/1947 (71.7%)	71.6%
80+	515/562 (91.6%)	91.7%	2594/3105 (83.5%)	83.9%	821/1029 (79.8%)	79.9%	5964/7785 (76.6%)	77.0%	1019/1276 (79.9%)	79.7%

In-hospital mortality (Invasive mechanical ventilation)

	North		Northeast		Central-West		Southeast		South	
	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed	Complete case	Imputed
Age groups										
20-39	193/250 (77.2%)	75.7%	551/791 (69.7%)	65.4%	164/279 (58.8%)	57.4%	774/1559 (49.6%)	49.8%	176/399 (44.1%)	43.8%
40-49	269/334 (80.5%)	80.2%	717/947 (75.7%)	72.5%	273/397 (68.8%)	67.8%	1317/2239 (58.8%)	59%	274/571 (48%)	48%
50-59	446/520 (85.8%)	85.8%	1291/1579 (81.8%)	79.9%	456/605 (75.4%)	74.4%	2662/3923 (67.9%)	68.1%	604/959 (63%)	62.6%
60-69	748/821 (91.1%)	91.1%	2056/2353 (87.4%)	86.4%	743/875 (84.9%)	84.5%	4424/5673 (78%)	78.6%	1057/1426 (74.1%)	74.2%
70-79	711/765 (92.9%)	93.4%	2289/2494 (91.8%)	91.3%	787/863 (91.2%)	91%	4551/5291 (86%)	86.5%	1095/1293 (84.7%)	84.6%
80+	443/465 (95.3%)	95.3%	2059/2158 (95.4%)	95.1%	616/648 (95.1%)	94.9%	3597/3963 (90.8%)	91.2%	703/765 (91.9%)	91.8%

eTable 32. Comparison of multicentre COVID-19 cohorts

	Multicentre study cohort					
Authors	Ranzani et al.	Docherty et al. ¹	Grasselli et al. ²	Gupta et al. ³	Karagiannidis et al. ⁴	Ñamendys-Silva et al. ⁵
Country	Brazil	United Kingdom	Italy	United States	Germany	Mexico
Coverage	Nationwide	Nationwide	Lombardy	Nationwide	Nationwide	Nationwide
Population	Adults (≥20 years)	No age restriction	No age restriction	≥ 18 years	≥ 18 years	≥ 18 years
Hospitalized patients (N)	232,036	20,133	3,988	2,215	10,021	131,583
ICU patients analyzed (N)	79,687/205,493	3,001	3,988	2,215	Not reported	Not reported
Patients with invasive mechanical ventilation (N)	45,205 / 196,248	1,658	2,929	1,494	1,318	12,018
Age (median, IQR or mean, SD)	61 (47-73)	72·9 (58-82)	63 (56-69)	60·5 (14·5)	72 (57-82)	Not reported
Male (%)	56%	60%	79·9%	64·8%	51·9%	Not reported
Patients that remained hospitalized at the end of study or incomplete data (N, %)	22,252 (8·8%)	6,769 (34%)	501 (12·6%)	137 (6·2%)	4·8%	Not reported
In-hospital mortality of patients with a hospital discharge (%)	38%	5165/13,364 (39%)	Not reported	35·4%	22%	Not reported
In-hospital mortality of ICU patients with discharge disposition at study end (%)	59%	54%	48·3%	39·5%	Not reported	Not reported
Mortality in patients with invasive mechanical ventilation (%)	80·0% (36,046/45,205)	69%	51·7%	Not reported	52·8%	73·7%

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